# *Fukushima Mon Amour*

*Methods to Remediate Nuclear Waste*

**by Robert A. Nelson**

Ever since March 11, 2011, when three Fukushima Daiichi nuclear reactors were destroyed by an earthquake, tsunami, explosion, and meltdown, a subsurface river flowing under the site has been washing over the missing molten cores and pouring uncountable millions of gallons of radioactive water into the Pacific Ocean. In addition, the atmospheric fallout has irradiated the entire planet.

The result has been a massive die-off of marine life that is without precedent. Fukushima Daiichi has in fact become an actual Extinction Level Event that threatens to end most animal life on Earth. News media now regularly report huge fish kills, whale beachings, starving sea lions, dolphins and birds on the west coast of the USA, but allegedly expert scientists invariably continue to attribute the deaths to toxic algae blooms or rising ocean temperatures due to climate change.

Not one of the craven academic, industry, or government apologists dare risk their careers by stating the obvious reason -- radiation poisoning. The few independent researchers who claim Fukushima to be the cause are demonized and even prosecuted, as was Canadian Dana Durnford. The University of Victoria and Woods Hole Oceanographic Institute had him arrested and charged with harassment, and his videos, which document the decimation of marine life along the coast of British Columbia, were deleted from YouTube. Only a few dedicated websites continue to aggregate news reports about the disaster. Most eminent of these is ENENews, which operates without funding.

A typical example of the delayed, minimalized, and trivialized acknowledgement of the immensity of the catastrophe appeared in the journal New Scientist under the title "Fukushima accident gave everyone an X-ray's worth of radiation" :
"We don't need to worry," says Nikolaos Evangeliou at the Norwegian Institute for Air Research, whose team has conducted the first global survey of radiation exposure caused by the meltdown of three nuclear reactors at the Fukushima-Daiichi nuclear plant… "What I found was that we got one extra X-ray each," says Evangeliou… But Evangeliou says that the effects on wildlife around the plant might be more severe. Already, he says, increased levels of radiation around Fukushima have been linked to declines in bird populations there between 2011 and 2014. "There have also been reports of declines in other species such as insects and some mammals," he says…"
What an mealymouthed understatement...

Meanwhile, Tepco, the company that operates the Fukushima reactors, has no idea what to do other than remove fuel rods and contaminated material to storage elsewhere in the vicinity. The reactor cores remain missing and pose an enormous threat of a subterranean hydrothermal explosion. In addition, the ground beneath the crippled reactors is waterlogged, and the buildings are subsiding.

There are industrial products available that solidify soil by chemical lithification, but they are not being applied at Fukushima. Bionic Soil Solutions LLC, a small company in New Mexico, is exemplary. ( Here are some patents for soil lithification : US4413931, KR101276095, KR20130023928, CN101892853, RU2199569, RU2184095, RU2162068, KR100788441, PL381168 )

The public is being told by authority figures that nothing can be done about nuclear waste except to contain it in pools or vitrified casings. In reality, however, several dozen methods have been invented for the remediation of radioactive matter by transmutation. The nuclear industry is well aware of such technologies, but none are being implemented in any way whatsoever. A comprehensive list of pertinent patents is included in evidence at the end of this article.

In 2000, The Planetary Association for Clean Energy ( PACE ) published a paper titled "Advanced transmutation process and its application for the decontamination of radioactive nuclear wastes". Authors Andrew Michrowski and Mark Porringa reported on "the observed and successful and developed advanced transmutation processes for the disposal of nuclear waste developed by Yull Brown involving a gas developed by him with a stoichiometric mixture of ionic hydrogen and ionic oxygen compressed up to 0.45 MPa. The radioactivity in samples decreases by up to 97%, rapidly, simply and at low cost."

Demonstrations of the phenomenal process were witnessed by dozens of people including two U.S. Congressmen, Representatives Berkeley Bedell and Daniel Haley :
"On August 24, 1991, China's Baotou Nuclear Institute released a Report # 202 , 'The Results of Experiments to Dispose of Radiation Materials by Brown's Gas', which establishes that experimentation on Cobalt 60 radiation source decreased radiation by about 50% or half-life of radiation -- but sometimes more radiation is decreased which needs investigation of possibilities for decreasing more of the radiation in single treatments of exposure to Brown's Gas flame, lasting only a few minutes, in the samples as described in the table below.

First Experiment / Second Experiment
Source Intensity : 580 millirads/hour / 115 - 120 millirads/hour
After Treatment : 220 - 240 millirads/hour / 42 millirads/hour

"In another test conducted by Yull Brown before a public audience including U.S. Congressman Hon. Berkeley Bedell with a committee responsible in this area of concern, the experiment ran as follows as reported by the press:

"Using a slice of radioactive Americium ... Brown melted it together on a brick with small chunks of steel and Aluminum ... After a couple of minutes under the flame, the molten metals sent up an instant flash in what Brown says is the reaction that destroys the radioactivity. Before the heating and mixing with the other metals, the Americium, made by the decay of an isotope of Plutonium, registered 16,000 curies per minute of radiation. Measured afterward by the [Geiger Counter], the mass of metals read less than 100 curies per minute, about the same as the background radiation in the laboratory where Brown was working.

"This experiment indicated a reduction of radiation in the order of over 99% (to about 0.00625 of original level) -- in less than 5 minutes, with minimal handling. The improvement in the de-radioactivation process from about 50% to nearly 100% has come only with persistent research over the decades by Brown and his colleagues...

"The Hon. Berkeley Bedell has reported, "it has been my good pleasure to witness experiments done by Prof. Yull Brown in which it appeared to me that he significantly reduced the radioactivity in several nuclear materials. Under the circumstances, I believe it is very important for our federal government to completely investigate Dr. Yull Brown's accomplishments in this area.

"On August 6, 1992, almost a year after the Chinese nuclear report, Prof. Yull Brown made a special demonstration to a team of 5 San Francisco field office observers from the United States Department of Energy, at the request of the Hon. Berkeley Bedell. Cobalt 60 was treated and resulted in a drop of Geiger readings from 1,000 counts to 40 -- resulting in radioactive waste residue of about 0.04 of the original level. Apprehensive that somehow the radioactivity might have been dispersed into the ambient environment, the official requested the California Department of Health Services to inspect the premises. The health services crew found no radioactivity in the air resulting from this demonstration nor from another repeat demonstration held for their benefit.

"This sequence of experiments was monitored by the Hon. Daniel Haley, the legislator who established the forerunner New York State Energy Research and Development Agency.

"Other demonstrations, measured with under more sophisticated protocol and instrumentation have been made before Japanese nuclear experts, including four scientists from Toshiba and Mitsui (Cobalt 60 of 24,000 mR/hr with one treatment to 12,000 mR/hr). The Japanese scientists were so excited by what they saw that they immediately purchased a generator and air shipped it to Japan. They sent Prof. Brown a confidential report of some of their results. Subsequently, they tried to obtain addition Brown's Gas generators directly from the People's Republic of China...

"At this time, Brown's Gas generators are mass produced in the Bautou, a major research city in the People's Republic of China by the huge NORINCO factory which also manufacturers locomotives and ordinances -- and services the nation's nuclear industry complex. Most of these generators (producing up to 4,000 litres/hour/2.4 water at 0.45 MPa with power requirements ranging from 0.66 kW up to 13.2 kW) are marketed for their superior welding and brazing qualities, costing between $ 2,000 and $ 17,000. Some units have been used for the decontamination of radioactive materials since 1991. In general, Brown's Gas generators produce between 300 and 340 litres of Brown's Gas per 1 kW energy DC current approximately and one litre of water produces 1.866.6 approximately litres of gas.

A generator which produces 10,000 litres per hour has been built specifically for the reduction of nuclear waste..."

**Results**

**Radioactivity of Americium 241 sample before and after treatment with Brown's Gas flame**

*in counts per minute*

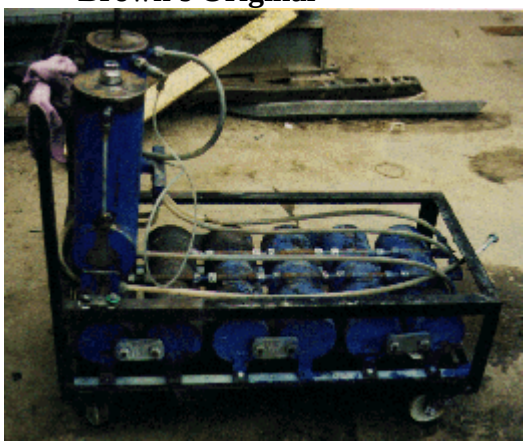
(average background laboratory count: 100 cpm)

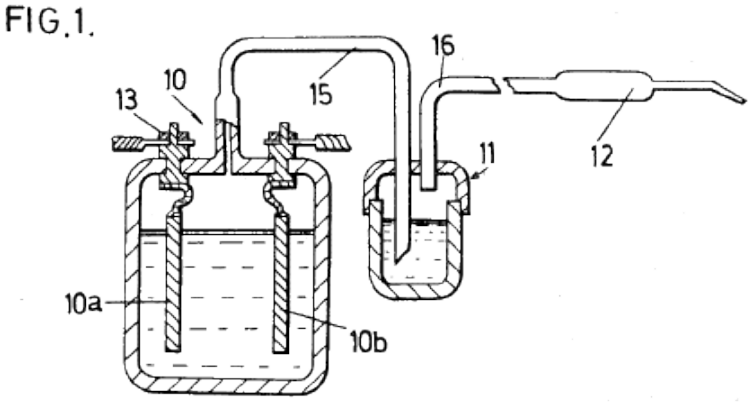
| Americium 241 sample status | BN 200 unit Baseline data | IE unit test #1 | |
|---|---|---|---|
| Sample at start of test | 100,000 | 110,000 | |
| Sample after 10 sec. treatment | 1,500 | 1,500 | |
| *crushed residue* | *5,000* | *4,000* | |
| *swipe from hood wall* | *400* | *400* | |
| *ashes from fan micronic filter* | *150* | *120* | |
| Total count after treatment | 5,550 | 4,520 | |
| Radioactivity remaining | 5.6% | 4.1% | |

Videos of Rep. Dan Haley speaking about the demonstration can be seen here and here on YouTube.

**Yull Brown**   **Rep. Dan Haley**

**Brown's Original Generator**





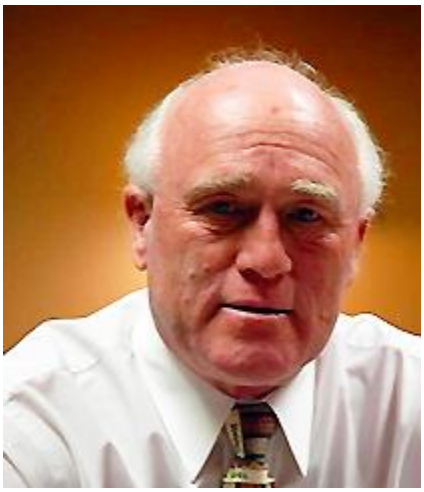

**USP 4014777**

Industrial Brown's Gas generators also are manufactured by BEST Korea, Ltd.

In the experience of inventor David Yurth, it was an effort in futility to try to interest the U.S. Department of Energy in his method of remediation. In an email to fellow researcher Gary Vesperman in 2013, Yurth wrote :
"I have beaten my head against this wall since 1994, when S-X Jin, David Faust and I began testing [ Ken Shoulders' ] High Density Charge Clusters as a way of remediating radioactive emissions produced by spent nuclear fuels. We developed

a system that was totally viable. We developed the math that explained what it was and how it worked. We conducted the experimental protocols for 7 years and documented the procedures that were used to enable and sustain it. We submitted this info to US DOE in 2003 by invitation. In 2004 our system was independently validated by the guys at Sandia Labs. In 2005 I was contacted by Dr. Frank Goldner, the senior nuclear scientist responsible for developing and testing remediation technologies at the agency. He screamed at me and threatened to have me and Dick Shamp arrested under FISA unless we stopped sending documentation to the Department and discontinued our work. I stopped. Dick did not. In 2009, after Obama was elected, Dick contacted the #3 guy at DOE, a career bureaucrat who has served as personal private secretary to the Sec'y of DOE for more than 30 years named Dr. Eysan Khan. He apologized profusely for the way we had been treated and invited me to come to DC to present the HDCC methodology to all 26 of his senior department heads. Two weeks before I was scheduled to make the trip, he called to tell me that he had gotten so much push-back from 'clients' of DOE about my presentation that he couldn't tolerate the pressure. The presentation was cancelled.

"This has nothing to do with Yucca Mountain . It has everything to do with the government's secret and unlawful use of public utilities who generate atomic power as the source for high grade uranium and weapons grade plutonium. They don't want the problem solved because it would deprive them of their only viable source of supply. They don't give a fart in a windstorm about the risks they impose on local populations like Fukushima – all they care about is using nuclear weapons to control the planet. And they are getting away with it. That's why this subject makes no sense to anyone who talks about it – the real agenda has nothing to do with public safety or possible catastrophic contamination of the planet.



**David Yurth**

Yurth elaborated on the details of the debacle on his book "*The Ho Chi Minh Guerilla Warfare Handbook: A Strategic Guide For Innovation Management*", excerpted here :

"After talking about the problem with several colleagues, we decided that remediation of radioactive emissions generated by spent nuclear fuel wastes was a problem that could and should be solved...

"In 1995 I met with a very special Chinese physicist by the name of Shiang Xian Jin... When I met him, Jin was writing papers about a totally new kind of technology, patented in the US by a genius inventor/scientist by the name of Kenneth Shoulders...

"After seven years of testing and bench top development, Jin [ and instrumentation engineer David Faust of Drexel University ] succeeded in demonstrating that a simple high voltage charge cluster generator could produce a high density stream of clusters of electrons which could be propelled through a proton-rich environment [such as deuteride gas] to impact a radioactive target material in a way that would effectively eliminate gamma ray emissions and reduce alpha [nuclear particle] emissions to ambient background levels in less than seven hours. It was a good beginning.

"In simple terms, what this meant was that a low velocity torus [a self-organizing standing wave in the shape of a donut] comprised of 6.022 x 1023 electrons [also known as Avogadro's Number, this is 6.022 times 10 with 23 zeroes after it] could be generated by a controlled device, magnetically driven through a cloud of free protons and directed at a specific target with control and consistency. The velocity of the charge clusters was relatively low [less than 10% of the speed of light] when compared to the kinds of velocities demonstrated by nuclear particle accelerators, but the amount of kinetic energy produced by the interaction was enormous. .. But instead of creating a chain reaction, the impact simply knocked the atomic particles apart long enough to release as much as 50% of the nuclear binding energies. Very shortly after being knocked apart by the proton impact, the nuclear particles realigned themselves and rejoined to form nuclei with lower energy states and smaller atomic nuclear numbers...

"By the end of 2002, we were confident that we had developed and validated a simple, affordable, effective way to treat high level nuclear waste materials so that they produced no radioactive emissions at all. In fact, when the laboratory results were validated by other laboratories, it was discovered that spent nuclear fuel rods could be induced to produce up to nine times as much heat output during HDCC treatment as they do before being retired to water-borne storage tanks. This, we thought, was just icing on a very attractive and commercially valuable technological cake...

"From the outset, our team had acted on a set of assumptions that seemed completely valid at the time but which later proved to be very ill advised. We assumed, for example, that because the nuclear waste problem was global, everyone would welcome a solution. We assumed that our agendas for carefully, scientifically defining and resolving the problem sets were consistent with those

of the government agencies tasked by law and public policy to do the same thing. We assumed that the public utilities and providers of the technologies that support the nuclear power production industry would welcome a simple, cost-effective, efficient solution to a universal problem. We were sadly mistaken but did not discover how misguided our attempts were until several years and many hundreds of thousands of dollars later.

"Dick Shamp, in his role as President of Nuclear Remediation Technologies, contacted Dr. Condoleezza Rice while she was serving as Director of the National Security Council at the White House. She passed his proposal off to one of her NSC staff members, who sent it to the Department of Energy. The proposal eventually found its way to the desk of Dr. Frank Goldner, AFCI Program Technical Director, Office of Advanced Nuclear Research, at DOE, who eventually responded by inviting us to submit a raft of documents, all of which taken together were needed to provide DOE's staff engineers and scientists with sufficient information to enable them to evaluate our claims and determine whether the HDCC program would qualify for research and development support. Over a two year period we produced more than 1,800 pages of application and disclosure documents, project descriptions, white papers, laboratory reports, R&D protocols, benchmarks, timetables, milestones, and so on. The process was costly and time consuming, but we kept at it because we had convinced ourselves that all the work we were engaged in could only produce valuable and useful results.

"DOE dispatched three of its top remediation consultants to talk with our team, including Dr. Tom Ward and two other DOE consultants who were actively involved in the development and testing of other protocols at Los Alamos and Sandia Laboratories. We believed, based on the kinds of responses we continued to receive from Dr. Goldner and his staff at DOE that the NRT technologies not only qualified for funding support but that we would be contracted by DOE-affiliated laboratories at MIT and other prestigious universities to jointly develop and deploy successive iterations of the HDCC treatment devices in beta tests related to five different industrial applications.

"We prepared and filed a patent application which explained the proprietary features of the NRT HDCC-based radioactive remediation and treatment system. As a team, we had dedicated nearly 50 man-years over nearly a decade to develop and mature the technology. By the time the fateful call from Frank Goldner came in November of 2003 we were convinced that NRT was well on its way to becoming a global player. On a stormy afternoon in mid-November, my phone rang. Dick Shamp was on the line. He sounded breathless, as if he had been running up and down the stairs. He told me he had Frank Goldner on the phone and wanted to conference me in, so I told him to go ahead. The instant Dr. Goldner came on the line, he began screaming. Literally. He was yelling so loud that I had to put the receiver a foot away from my head to avoid damaging my ear. At first I was just astonished. I had never been spoken to in that tone of voice by anyone in my life so it took me a few seconds to recover my composure.

"During his diatribe, Goldner accused us of all sorts of things, including impermissibly bombarding Energy Secretary Spencer Abraham's office with an endless stream of unnecessary, unwanted, useless correspondence. He had been specifically instructed by Mr. Abraham, he said, to put a stop to our correspondence. He told us that the Secretary did not want our correspondence on file and demanded that we stop sending it to him. Somewhere in the middle of his screaming I screamed back. After I had managed to put a stop to his tirade, I got his undivided attention by telling Dr. Goldner that I had turned on my tape recorder and intended to send a copy of the tape to Secretary Abraham if he didn't shut up.

"What followed was one of the most astonishing conversations I have ever participated in in my life. We had done everything asked of us by Goldner and his minions at DOE. We had submitted all the documents, made all the disclosures, cooperated with all their consultants and demonstrated that the NRT system was both viable and effective. Goldner informed us that notwithstanding all that, the Department's policy called for the encapsulation and burial of high level radioactive nuclear waste under Yucca Mountain. No other technology, no other means of remediation, no other alternative would be permitted to impinge on the Department's policy, under any circumstances. We were ordered forthwith to cease and desist sending any further correspondence to DOE, at any level, for any reason, under any circumstances, related to our treatment system. Further, we were informed that NRT would be denied permission to obtain samples of any radioactive materials under any circumstances, whether for further testing and evaluation or any other purposes. In short, we were told that the United States government and the agency charged with protecting the welfare of its citizens had decided to specifically prohibit the implementation of a technology that had been demonstrated to solve the problem of radioactive emissions generated by high level spent nuclear fuel wastes.

"We were understandably enraged by both the decision and the way the message had been delivered. Over the next two years Dick and I complained to several of our White House contacts, as well as dozens of senators and congressmen. We wrote and published op-ed pieces in a number of newspapers. We attempted to contact the DOE consultants we had been working with to see if we could figure what had gone wrong. Once the door had been shut at DOE, all our access to pertinent research information produced by government-sponsored laboratories immediately ceased. People we had worked with for years refused to take our calls. For reasons that have since become crystal clear, but which at the time remained a total mystery to us, the solution we had created was summarily booted off the playing field.

"Since that time, it has become clear that we made a number of serious tactical mistakes. The first and most important was the mistake of presumption. We assumed, because it seemed so patently obvious and logical at the time, that if

radioactive emissions was such a terrible global problem, and if we could develop an effective solution, we would have contributed something meaningful, useful and important to the process. What we have since learned is that we could not have been more mistaken. The line at the food trough leading from DOE to Yucca Mountain is $12 - $15 billion a year long. The high temperature gas cooled nuclear fission university-based research establishment consumes another $8 - $10 billion each year from DOE and its affiliated agencies. The ancillary research and consulting services related to the actual design, engineering, construction, and operation of the Yucca Mountain implementation plan accounts for another $10 billion a year more..."
Therefor it should not come as a surprise if nothing is ever done to remedy the situation at Fukushima or any of the other 440+ nuclear power plants and waste repositories with which we have damned ourselves. Nevertheless, in the eternal hope of a political and technocratic miracle, here is a comprehensive list of patented methods for acceleration of nuclear decay, garnered from the awesome European Patent Office :

**US2004238366**
**Method & System with Apparatus for Acceleration of Activity Decrease & Radioactive Material Deactivation**
**Inventor : Anatoly Kinderevich**

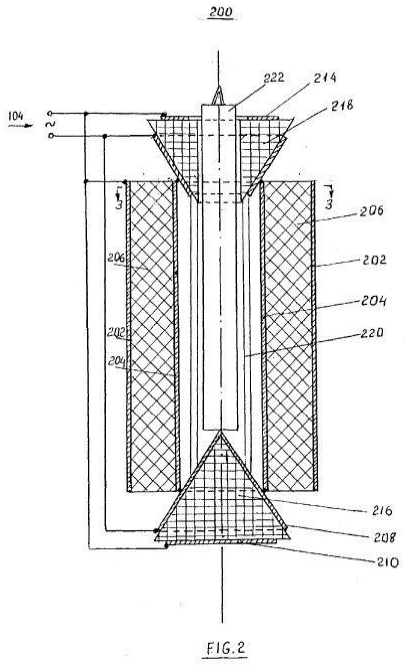
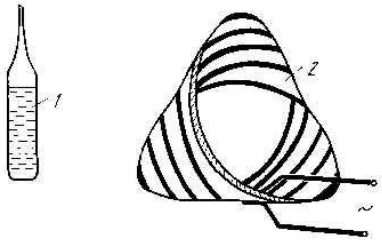


FIG.2

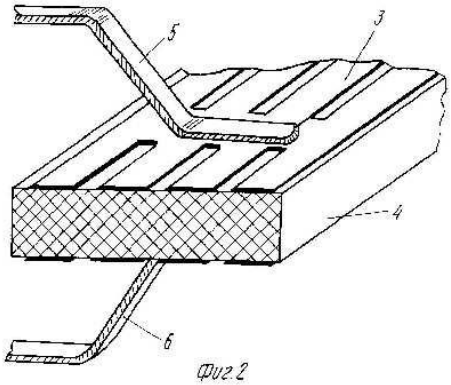
Radioactive material can be processed by an apparatus that includes at least a cylindrical outer shell electrode, an inner electrode, and a plurality of prism-shaped ferromagnetic elements positioned between the outer and inner electrodes. The prism-shaped ferromagnetic elements are positioned around the inner circumference of the metal cylinder. The inner electrode component is located

within the metal cylinder and is configured to cover the inwardly-pointing portions of the prism-shaped ferromagnetic elements. Radioactive material in a container is placed into the apparatus, and an AC voltage excitation signal is applied to the electrodes of the apparatus during treatment of the material. The frequency of the excitation signal is selected according to the frequency of structurization or the frequency of destructurization of the ferromagnetic material. The process can be monitored and controlled with the use of alpha, beta, and gamma radiation intensity measuring instruments.

**RU2061266**
**Method for Decontamination of Radioactive Materials**
**Inventor : Ivan Shahakhparanov**



Фиг.1



Фиг.2

Method involves application of external electrostatic field to radioactive material. Source of electrostatic fields is system of conducting strips which is located on dielectric substrate which is bent as Moebius band. Conducting strips are arranged in parallel to band edge and have contact terminals which are located on inner and outer sides of Moebius band in opposition to each other.

**US5076971**
**Method for Enhancing Alpha Decay in Radioactive Materials**
**Inventor : William Barker**

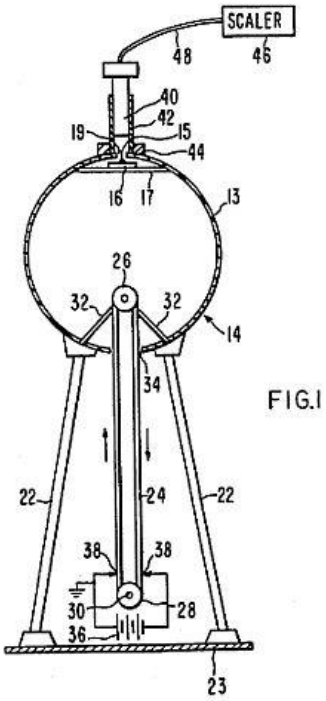
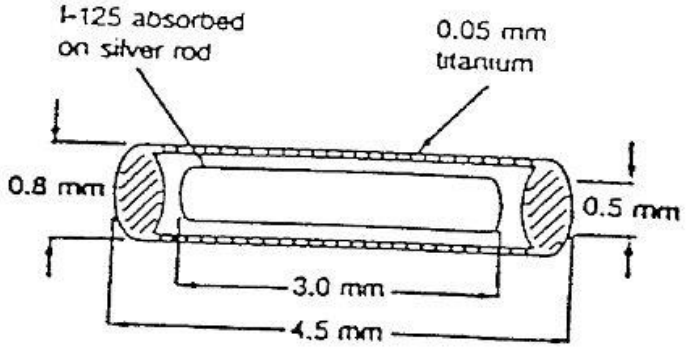



FIG.1

Apparatus and method for decontaminating radioactive materials by stimulating the atomic system of radioactive materials. The stimulus is kept applied to the radioactive materials for a predetermined time. In this way, the rate of decay of the radioactivity of the materials is greatly accelerated and the materials are thereby decontaminated at a rate much faster than normal. The stimulus can be applied to the radioactive materials placing them within the sphere or terminal of a Van de Graaff generator and allowing them to be subjected to the electrical potential of the generator, such as in the range of 50 kilovolts to 500 kilovolts, for at least a period of 30 minutes or more.

**US2002186805**
**Accelerated Radioactivity Reduction**
**Inventor : Sidney Soloway**



A method for reducing radioactivity in a radioactive sample is disclosed, comprising contacting said sample with a beam of photons, said beam having an energy level sufficient to cause said radioactive sample to emit particles including photons in an amount sufficient to accelerate a reduction in radioactivity of said sample. Also disclosed is a method of increasing radioactive decay in a radioactive isotope comprising the steps of: determining a beam of an effective energy and effective flux of photons to increase radioactive decay in the radioactive isotope; applying the beam to the radioactive isotope; and maintaining the beam for an amount of time effective to increase the radioactivity of the radioactive isotope.

**WO03098640**
**Processing Radioactive Material with Hydrogen Isotope Nuclei**
**Inventor : John Dash**

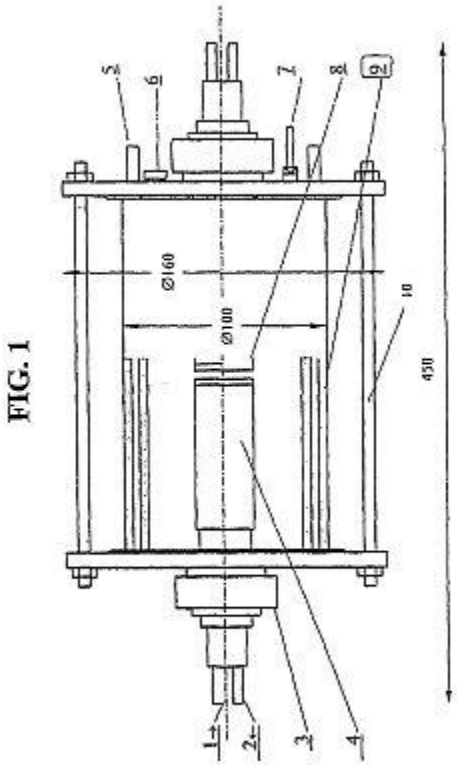
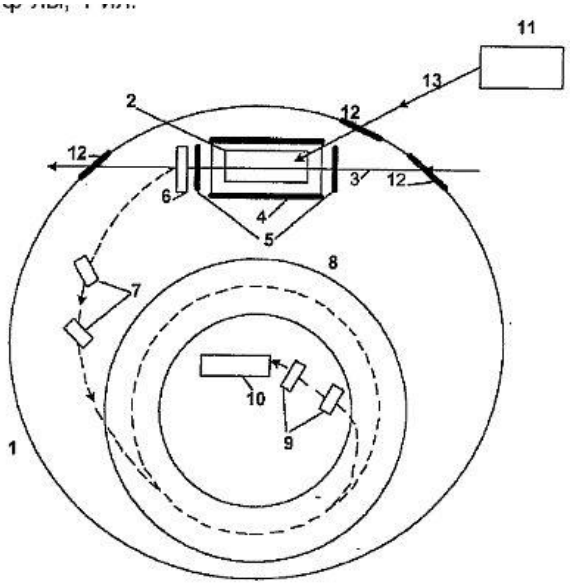


FIG. 1

A method for processing radioactive materials is disclosed. The method employs hydrogen isotope nuclei for the treatment of radioactive materials, such as uranium, and effectively increases the observed decay rate of such materials. Therefore, the disclosed method allows remediation of dangerous radioactive materials, such as uranium, without requiring long term, geologically-stable storage sites or costly, accelerator -based transmutation equipment.

**RU2169405**
**Method for Transmutation of Long-Living Radioactive Isotopes into Short-**

**Living or Stable Ones**
**Inventor : V.S. Buttsev, et al.**




Transmutation of long-living radioactive isotopes into short-living or stable ones is conducted under the action of electromagnetic radiation. In the process, highly ionized atoms with energy- resolved hole of accelerated beta-decay are produced from atoms of long-living radioactive isotope and held in ionized state until transmutation of mother nuclei to daughter short-living or stable ones takes place. With coefficient of operating time k preset for daughter nuclei, atoms of long-living radioactive isotope are held in highly ionized state for at least time beta, where beta is lifetime of mother nuclei under accelerated beta-decay conditions. Electromagnetic radiation may be effected by beams of accelerated charged particles (electrons, protons, or ions) or by photon flux. Radiation by charged-particle beam may be combined with photon flux radiation. EFFECT: enhanced transmutation efficiency dispensing with nuclear reactions of collision character and avoiding formation of by-products.

**US2002169351**
**Remediation of Radioactive Waste by Stimulated Radioactive Decay**
**Inventor : Paul Brown**

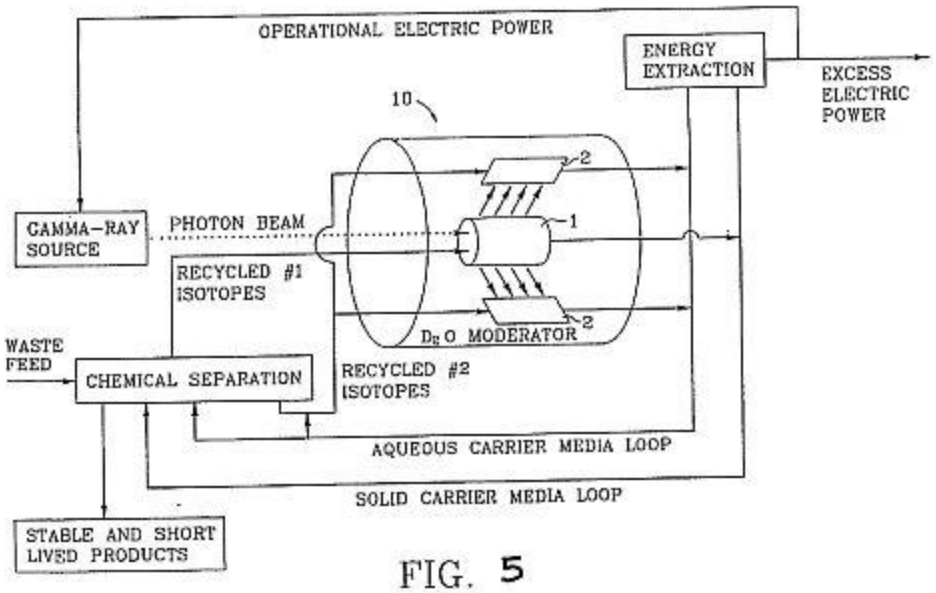
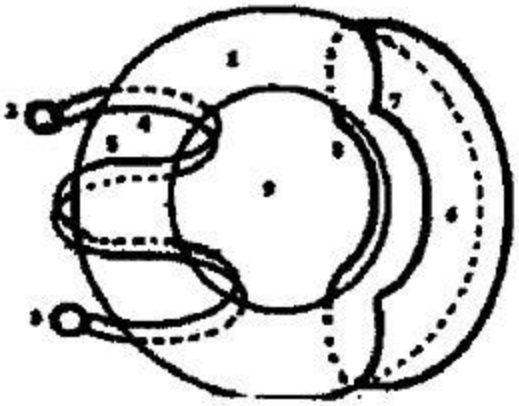



FIG. 5

Disclosed is a radioactive waste treatment process for transmuting long-lived radioisotopes into short-lived radioisotopes through applied nuclear physics. Nuclear reactions, specifically of the (gamma, n) type, also known as photo-disintegration, are utilized to accomplish this transmutation from troublesome, long-lived radioactive waste isotope(s) of given atomic mass to shorter-lived or stable materials of lower atomic mass, by exposing the troublesome isotopes to a high energy photon flux for a sustained time. Generally speaking, the target nucleus of the radioisotope(s) to be treated is irradiated by gamma photons of an energy greater than the binding energy of the neutron in the target nucleus. This causes the irradiated nucleus to absorb the gamma rays, thereby placing the nucleus in an excited state. Upon relaxation, the nucleus ejects a neutron through the (gamma, n) reaction, thereby transmuting the element to an isotope of lower atomic mass and shorter half-life.

**UA19842**
**DEVICE FOR SUPPRESSING RADIATION**
**Inventor : Y. Zuzanskyi, *et al.***
The proposed device for suppressing radiation contains a toroidal ferromagnetic core, inductance coils, and a screen.



Фіг. 1

**US2003202623**
**Low-Cost Elimination of Long-Lived Nuclear Waste**
**Inventor : Heinrich Hora**
Aspects of the present invention include a non-metal, a hydrogen absorbing metal, a selected isotope to be exposed to ions of hydrogen or ions of isotopes of hydrogen, and a hydrogen source. The hydrogen source can be an electrolytic solution, a gas or plasma. In some embodiments the hydrogen absorbing metal covers the non-metal to form a microsphere. The hydrogen absorbing metal is positioned to contact the hydrogen source. Further, the hydrogen absorbing metal can be made of multiple layers of dissimilar metals with different Fermi energy levels. The multiple layers of metals have interfaces where swimming electron layers exist. Interfaces between the non-metal, hydrogen absorbing metal, and the hydrogen source also exist with swimming electron layers. The selected isotope is placed in these regions of swimming electron layers to be exposed to the ions of hydrogen and its isotopes from the hydrogen source.

**DE19803629**
**Transmutation of Isotopes with Long Half-Life**
**Inventor : Heinrich Hora**
For the transmutation of long half-life isotopes, their surfaces are exposed to an electrolyte or a gas or plasma atmosphere to form intermediate layers or vol. zones of a number of structure layers. The threshold zones are placed against a carrier material or close to vol. zones of metals or metal layers, composed of metals capable of absorbing -1 atom% of hydrogen or its isotope.

**WO9403906**
**Methods for Manufacturing & Producing Products**
**Inventor : Ronald Brightsen, *et al.***
A method for generating high energy 32He particles includes the steps of accumulating protons and deuterons in intimate contact with a lattice structure storage member and repeatedly reacting one proton and one deuteron to produce 32He particles and excess energy greater than 6 MeV for each of the 32He

particles. A method for controlling an energy production reaction of isotopic hydrogen atoms includes steps for storing a first isotope of hydrogen and a second isotope of hydrogen in contact with a lattice structure to produce a first ratio of the first isotope to the second from a mixture having a second ratio of the first isotope to the second isotope, adjusting the energy of the lattice structure to initiate the energy production reaction caused by the interaction of one nucleus of the first isotope with one nucleus of the second isotope and controlling the second ratio to control the rate of the energy production reaction based on the interaction of the first isotope with the second isotope. Methods for treating radioactive waste by transmutation and for forming a superconductive material from a plurality of constituents, as well as methods for forming improved semiconductor devices, improved atomic lattice structures and improved molecular structures and ionic compounds, are described along with selection rules for fine tuning these methods. An apparatus for producing controlled emissions of high energy vHe particles, which can be adapted as a beam producing device or as motor, is also disclosed.

**WO03098640**
**Processing Radioactive Materials with Hydrogen Isotope Nuclei**
**Inventor : John Dash**
Embodiments of a method for processing radioacive materials, with a particular embodiment comprising processing uranium with hydrogen isotope plasmas, and a process for remediation of nuclear wastes by transmutation.

**DE19803629**
**Transmutation of Isotopes with Long Half Life**
**Inventor : Heinrich Hora**
For the transmutation of long half-life isotopes, their surfaces are exposed to an electrolyte or a gas or plasma atmosphere to form intermediate layers or vol. zones of a number of structure layers. The threshold zones are placed against a carrier material or close to vol. zones of metals or metal layers, composed of metals capable of absorbing atoms of hydrogen or its isotope.

**JP9197077**
**Electrode for Cold Nuclear Fusion & Method for Manufacturing Radioactive & Nonradioactive Element & Pervious Metal by Nuclear Transformation in Electrode**
**Inventor : Reiko Notoya**
To obtain an electrode for cold nuclear fusion which can manufacture isotopes, precious metals, rare elements or thermal energy through nuclear transformation by containing as a material for the electrode a substance which can cause nuclear transformation. Solution: Radioactive or nonradioactive isotopes are manufactured by the nuclear transformation in an electrode and the combination of nuclear reactions such as neutron capture and natural nuclear disintegration of products made through the nuclear reactions. The kinds of manufactured isotopes are very numerous, and it is especially easy to obtain non-single isotopes. Since

the conditions of electrolysis can be controlled very precisely, it is possible to manufacture only target substances precisely. For an electrode for cold nuclear fusion, an element whose atomic number is close to that of a precious metal or a rare element is chosen as a substance which can cause nuclear transformation, or a material for the nuclear transformation of a precious metal and a rare element. For example, W, Ag, Sn and Pt are cited as materials for platinum-family metals and gold. As materials for rare elements, chemical species such as the halogen family, alkaline metals, Po and W are chosen.

**US6738446**
**System and method for radioactive waste destruction**
**Inventor : Venneri, *et al.***
A method for transmuting spent fuel from a nuclear reactor includes the step of separating the waste into components including a driver fuel component and a transmutation fuel component. The driver fuel, which includes fissile materials such as Plutonium239, is used to initiate a critical, fission reaction in a reactor. The transmutation fuel, which includes non-fissile transuranic isotopes, is transmuted by thermal neutrons generated during fission of the driver fuel. The system is designed to promote fission of the driver fuel and reduce neutron capture by the driver fuel. Reacted driver fuel is separated into transuranics and fission products using a dry cleanup process and the resulting transuranics are mixed with transmutation fuel and re-introduced into the reactor. Transmutation fuel from the reactor is introduced into a second reactor for further transmutation by neutrons generated using a proton beam and spallation target.

**RU2052223**
**Method For Producing Stable Isotopes Due To Nuclear Transmutation, Such As Low-Temperature Nuclear Fusion Of Elements In Microbiological Cultures**
**Inventor : V. Vysotskij, *et al.***
A method of obtaining stable isotopes by nuclear fusion of elements in microbial cultures, including the preparation of the culture medium for the growth of microbiological cultures deficient isotope obtainable by transmutation, and containing the necessary transmutation initial isotopic components; growing in a nutrient medium microbiological cultures requiring these isotopes for their growth, isolating from the culture medium grown culture and isolation of stable isotopes [2] In the conventional method describes the procedure for growing microbiological cultures Aspergillus niger IFO 4066, Penicillium chrysogenum IFO 4689; Phizopus nigricans IFO 5781; Mucor rouxii IFO 0369; Saccharomuces cerevisiae IFO 0308 ; Torulopsis utilis IFO 0396; Saccharomyces ellipideus IFO 0213; Hansenula anomala IFO 0118 in a nutrient medium is an aqueous solution of a number of chemical compounds and deficient in one of the essential components for the growth of crops (potassium, magnesium, iron, calcium) and for monitoring, standard for them spedi. In experiments on the implementation of the method has been shown that the cultivation of these crops in the corresponding element deficient media (data media in these specific elements did

not exist) in the resulting culture of these elements were present, which can only be attributed to their synthesis in the nuclear transmutation of the other elements present, and isotopes.

**RU2034414**
**Accelerating Complex For Transmutation Of Nuclear Production Waste**
**Inventor : M. Danilov, *et al.***
( No abstract available )

**GB2246467**
**Transmutation treatment of radioactive wastes**
**Inventor : K. Konashi, *et al.***
A method for the transmutation treatment of radioactive wastes comprises: accelerating radioactive nuclides contained in the radioactive wastes to be treated to an energy level corresponding to a compound nucleus resonance level; and bombarding the accelerated nuclides into a thermal neutron field, which is under a magnetic field, to cause the compound nucleus resonance reaction to occur; thereby transforming the radioactive nuclides into those which are more stable or have shorter life. The nuclides are accelerated in accelerator 9 then passed into an annular-cylindrical chamber positioned about a reactor where they are treated with neutrons.

**US4721596**
**Method for net decrease of hazardous radioactive nuclear waste materials**
**Inventor : R. Marriott, *et al.***
A method for decreasing the amount of hazardous radioactive reactor waste materials by separation from the waste of materials having long-term risk potential and exposing these materials to a thermal neutron flux. The utilization of thermal neutrons enhances the natural decay rates of the hazardous materials while the separation for recycling of the hazardous materials prevents further transmutation of stable and short-lived nuclides.

**EP0030404**
**Method for net decrease of hazardous radioactive nuclear waste materials.**
**Inventor : R. Marriott,*et al.***
A method for decreasing the amount of hazardous radioactive reactor waste materials by separating from the waste of materials having long-term risk potential and exposing these materials to a thermal neutron flux. The utilization of thermal neutrons enhances the natural decay rates of the hazardous materials while the separation for recycling of the hazardous materials prevents further transmutation of stable and short-lived nuclides.

**GB970091**
**Transmutation of elements**
**Inventor : I. Noel**
A process for the synthesis of helium and the simultaneous generation of energy

comprises admixing in a steel pressure-tight vessel in presence of air following reactants in the following order: aluminium in a physical form presenting a large volume/surface ratio, solid sodium hydroxide, and water in the ratio of 4 : 8 : 8. The reaction is stated to be thermonuclear involving the carbon cycle proposed by Bethe, the effect of which is to transmute hydrogen into helium.

**JP2004117106**
**Structure For Nuclide Transmutation And Method For Forming It**
**Inventor : T. Takehiko*,et al.***
To provide a structure for transmuting nuclides with a relatively small-scale device and a means for manufacturing the structure. ; SOLUTION: A mixed layer consisting of lamination layers of a Pd layer and a layer of a substance which has a smaller work function than Pd is placed on a substrate made of Pd, a Pd alloy, other metals occluding hydrogen or alloys of these metals, the structure shaped like an approximate plate where an additional Pd layer is placed on the mixed layer is formed and a substance which is given nuclide transmutation is supplied to the Pd layer of the structure. The substance which is supplied to the Pd layer and is given nuclide transmutation is acceptable if it has become metallic, and salt may adhere to the surface of it. Electrodeposition and ion implantation can be used as a means for supplying the substance which is given nuclide transmutation

**FR2855309**
**Plasma-free nucleon transmutation comprises use of piezoelectric actuators to produce energy particles compatible with targets**
**Inventor : G. Vitrac**
Nucleon transmutation, initiated by plasma-free fusion uses piezo-electric actuators to ensure particle transfer where the velocity vector benefits from additional quantum that favors collisions and automatically-triggered fusion. This accords, in particular, with the laws of velocity distribution and the probability of collisions for energy particles compatible with targets.

**US2003210759**
**Nuclide transmutation device and nuclide transmutation method**
**Inventor : Y. Iwamura, *et al.***
The present invention produces nuclide transmutation using a relatively small-scale device. The device 10 that produces nuclide transmutation comprises a structure body 11 that is substantially plate shaped and made of palladium (Pd) or palladium alloy, or another metal that absorbs hydrogen (for example, Ti) or an alloy thereof, and a material 14 that undergoes nuclide transmutation laminated on one surface 11A among the two surfaces of this structure body 11. The one surface 11A side of the structure body 11, for example, is made a region in which the pressure of the deuterium is high due to pressure or electrolysis and the like, and the other surface 11B side, for example, is a region in which the pressure of the deuterium is low due to vacuum exhausting and the like, and thereby, a flow of deuterium in the structure body 11 is produced, and nuclide transmutation is carried out by a reaction between the deuterium and the material 14 that

undergoes nuclide transmutation.

**RU2210630**
**Facility For Generation Of Gas Mixture And Transmutation Of Nuclei Of Atoms Of Chemical Elements**
**Inventor : F. Kanarev, *et al.***
Facility for generation of gas mixture and transmutation of nuclei of atoms of chemical elements has body made of dielectric material with though hole, interelectrode chamber, cooling chamber for vapor condensation, vessel for working solution, branch pipes to feed and drain working solution, anode connected to positive pole of power supply source and cathode connected to negative pole of power supply source. Body has upper boss with internal cavity. Cathode is brought into cathode space from above through axial hole of upper boss. Internal space of boss communicates with cooling chamber which space is connected to vessel for working solution.

**US6233298**
**Apparatus for transmutation of nuclear reactor waste**
**Inventor : Charles Bowman**
A subcritical reactor-like apparatus for treating nuclear wastes, the apparatus comprising a vessel having a shell and an internal volume, the internal volume housing graphite. The apparatus having means for introducing a fluid medium comprising molten salts and plutonium and minor actinide waste and/or fission products. The apparatus also having means for introducing neutrons into the internal volume wherein absorption of the neutrons after thermalization forms a processed fluid medium through fission chain events averaging approximately 10 fission events to approximately 100 fission events. The apparatus having additional means for removing the processed fluid medium from the internal volume. The processed fluid medium typically has no usefulness for production of nuclear weapons.

**US6233299**
**Assembly for transmutation of a long-lived radioactive material**
**Inventor : T. Wakabayashi**
A new transmutation assembly permits an efficient transmutation of a long-lived radioactive material (long-lived FP nuclides such as technetium-99 or iodine-129) which was produced in the nuclear reactor. Wire-type members of a long-lived radioactive material comprised of metals, alloys or compounds including long-lived FP nuclides are surrounded by a moderator material and installed in cladding tubes to form FP pins. The FP pins, and nothing else, are housed in a wrapper tube to form a transmutation assembly. The wire-type members can be replaced by thin ring-type members. The transmutation assemblies can be selectively and at least partly loaded into a core region, a blanket region or a shield region of a reactor core in a fast reactor. From a viewpoint of reducing the influence on the reactor core characteristics, it is optimal to load the transmutation assemblies into the blanket region.

**WO9919881**

**Low Temperature Electrolytic Nuclear Transmutation**

**Inventor : James Patterson, *et al.***

A method for producing low temperature nuclear transmutations by electrolysis in an aqueous media. New elements produced by transmutation are identified as having discrete peaks in occurrence by atomic number (Z) and by atomic mass (A). New complex nuclei produced by transmutation are idendified as having existed based upon the nature and occurrences of fission transmutation elements produced. The electrolytic cell (12) includes a non-conductive housing (14) having an inlet (54) and an outlet (56) and spaced apart first and second conductive grids (38 & 44) positioned therein. A plurality of cross-linked polymer non-metallic cores each having a uniform conductive exterior metallic surface formed of a high hydrogen absorbing material form a bed (35) of conductive beads (36) closely packed within the housing (14) in electrical contact with the first grid (38) adjacent the inlet (54). An electric power source (15, 16) in the system (10) is operably connected across the first and second grids.

**WO9740211**

**System, Electrolytic Cell And Method For Producing Excess Heat And For Transmutation By Electrolysis**

**Inventor : James Patterson,*et al.***

An electrolytic cell (12), system (10) and method for producing excess quantities of heat as a result of low temperature nuclear transmutations which occur during electrolysis in an aqueous media within the cell (12). The electrolytic cell (12) includes a non-conductive housing (14) having an inlet (54) and an outlet (56) and spaced apart first and second conductive grids (38 & 44) positioned within the housing (14). A plurality of preferably cross linked polymer non-metallic cores each having a uniform conductive exterior metallic surface formed of a high hydrogen absorbing material, such as metallic hybride forming material, form a bed (35) of conductive beads (36) closely packed within the housing (14) in electrical contact with the first grid (38) adjacent the inlet (54).; An electric power source (15, 16) in the system (10) is operably connected across the first and second grid (38 & 44) whereby electrical current flows between the grids (38 & 44) and within the aqueous media (59) flowing through the cell.

**WO9803699**

**Nuclear Transmuted Elements Having Unnatural Isotopic Distributions By Electrolysis And Method Of Production**

**Inventor : James Patterson, *et al.***

A method for producing low temperature nuclear transmutations which occur during electrolysis in an aqueous medium within a cell (12). New elements produced by transmutation during operation of the cell are both higher and lower in atomic mass than the original element undergoing transmutation. Many of the new elements also exhibit isotopic shifts from natural isotope abundance. The electrolytic cell (12) includes a non-conductive housing (14) having an inlet (54)

and an outlet (56) and spaced apart first and second conductive grids (38 and 44) positioned within the housing (14).; A plurality of preferably cross-linked polymer non-metallic cores each having a uniform conductive exterior metallic surface formed of a high hydrogen absorbing material, such as a metallic hydride forming material, form a bed (35) of conductive beads (36) closely packed within the housing (14) in electrical contact with the first grid (38) adjacent the inlet (54). An electric power source (15, 16) in the system (10) is operably connected across the first and second grid (38 and 44) whereby electrical current flows between the grids (38 and 44) and within the aqueous medium (59) flowing through the cell (12) during cell operation.

**US2003226401**
**Atomic structure recognition and modification method and apparatus**
**Inventor : H. Letovsky**
The present invention provides methods and apparatus for determining the precise makeup of atomic and molecular structures, as well as providing the capability of modifying said structures. The invention uses induced resonant frequency wave effects to define and modify the electromagnetic, electrical, radioactive, atomic weight, and co-valent bonding characteristics of matter. One embodiment of the present invention may produce directionally controllable magnetic fields in gaseous media that interact with magnetically polarized vehicle surfaces to allow high-speed, highly energy efficient inter-planetary space travel. Another embodiment of the invention may neutralize waste products remaining from nuclear fission power production. The invention utilizes controlled multi-spectrum frequency induction to catalyze changes in atomic structures that may include: focused and dramatically amplified release of energy relative to natural states of matter; production of new alloys; transmutation of dangerous organic compounds into non-toxic media; and controlled polarization of matter. The benefits of the invention may include highly efficient interstellar spacecraft propulsion systems, hazardous waste elimination systems, efficient electricity production, and health enhancement of biological organisms.

**US2012269309**
**Nuclide transmutation device and nuclide transmutation method**
**Inventor : Y. Iwamura, *et al.***
The present invention produces nuclide transmutation using a relatively small-scale device. The device (10) that produces nuclide transmutation comprises a structure body (11) that is substantially plate shaped and made of palladium (Pd) or palladium alloy, or another metal that absorbs hydrogen (for example, Ti) or an alloy thereof, and a material (14) that undergoes nuclide transmutation laminated on one surface (11A) among the two surfaces of this structure body (11).; The one surface (11A) side of the structure body (11), for example, is a region in which the pressure of the deuterium is high due to pressure or electrolysis and the like, and the other surface (11B) side, for example, is a region in which the pressure of the deuterium is low due to vacuum exhausting and the like, and thereby, a flow of deuterium in the structure body (11) is produced, and nuclide transmutation is

carried out by a reaction between the deuterium and the material (14) that undergoes nuclide transmutation.

**WO0231833**
**Nuclear Transmutational Processes**
**Inventor : A. De Geus**
The invention relates to a method of generating energy, comprising the steps of: a. introducing hydrogen in a reactor vessel, the vessel comprising a cathode, an anode and an ionization element, the cathode comprising a primary and a secondary transmutational element, the transmutational elements having in their nucleus a number of neutrons which is larger than the number of protons, and wherein at least one neutron has a preferred orientation; b. Ionizing at least a part of the hydrogen with the ionization element to form a plasma, c. Applying a voltage differential across the cathode and the anode, causing protons to travel to the cathode and to induce a transmutation of the transmutational elements which combine to form an element of higher mass number than the mass number of said transmutational elements under the release of energy; and d. collecting heat and/or on other energy formed in step c. In a preferred embodiment the primary transmutational element comprises formula (i) or any combination thereof, whereas the secondary transmutational element comprises formula (ii) or any combination thereof.

**NL1031962**
**Energy generating process for producing electricity, comprises electron discharge in flow of nitrogen or air in order to cause nuclear transmutation of nitrogen into carbon monoxide**
**Inventor : A. de Geus**
A flow of nitrogen or air, or a plasma thereof, through a reactor (1) is exposed to an electron discharge, resulting in the nuclear transmutation of gaseous nitrogen into carbon monoxide, followed by oxidation of the carbon monoxide to carbon dioxide. A method for generating energy comprises passing a continuous flow of nitrogen or air, or a plasma thereof, through an optionally enclosed reactor in which electron discharge takes place, resulting in the nuclear transmutation of gaseous nitrogen into carbon monoxide, followed by oxidation of the carbon monoxide to carbon dioxide. Also included for the process apparatus, comprising a reactor with a pressure reducing means (6) and an inlet (7) for providing an intermittent supply of nitrogen or air; at least one cathode and at least one anode on the inner side of the reactor space ends; a means connected to the cathode (4) and anode (5), used for generating high voltage pulses with a predetermined waveform and frequency between the cathode and anode; a casing around the reactor, through which air flows in order to be heated by the process heat from the reactor; and optional conduits for recirculating the heat-laden air back to the casing.

**NL1033078**
**Energy generating process, by applying voltage between cathode comprising**

**transmutation elements and anode in reactor vessel containing plasma**
**Inventor : A. de Geus**
The process comprises the following steps: (A) adding hydrogen to a reactor vessel (6) containing a cathode (8), anode (9) and optionally an ionization element; the cathode comprises a primary and secondary transmutation element, the cores of which contain more neutrons than protons; the primary element contains a neutron with a preferable orientation; (B) ionizing at least some of the hydrogen to form a plasma; (C) applying a voltage difference with a given time character between the cathode and anode, causing a flow of protons towards the cathode, to which they become temporarily bonded; the transmutation elements next to the cathode surface and in the resulting plasma vortex fuse to form an element with a higher mass number and a second element or molecule with a lower mass number; and (D) collecting the radiation, which can be converted directly into electricity or heat.

**US2005013397**
**Multi-Step, Time Programmed Procedure For The Transmutation Of Radioactive Wastes And Multi-Region Salt Melt Apparatus For Carrying Out The Procedure**
**Inventor : G. Csom, *et al.***
A radiocactive waste containing medium is circulated within two or more systems (1,2,3) separated from each other flowtechnically; and the circulated radioactive waste is exposed to neutron radiations of different energy spectrum in each system by operating a reactor physically united entirety of irradiated sections of the said systems as a nuclear reactor or an accelerator driven subcritical system. Each system (1,2,3) has a heat exchanger (9,10) and, in given cases, a circulating pump (10,21) and an expansion tank (5,16,27). The disclosed apparatus has two or more reactor regions (1,2,3) separated from each other by partitions (37,38) and, preferably, arranged coaxially within a reactor space encircled by a common shell structure (39). A particle beam (45) produced by a particle accelerator is preferably directed into the innermost reactor region (3).

**WO9735324**
**Method For Preparing Highly Radioactive Materials For Transmutation And/Or Burn-Up**
**Inventor : C. Fuchs, *et al.***
The invention concerns a method of preparing highly radioactive materials for transmutation and/or burn-up by irradiation in a nuclear plant. The invention proposes that the materials are first converted into liquid form by melting or chemical dissolution and a porous carrier material which is essentially insoluble in the liquefied materials is impregnated with the liquefied materials and then heated in such a way that the materials are converted into the finally required chemical form and density.

**RU2212072**
**Method And Device For Transmutation Of Radioactive Wastes**

**Inventor : A. Levadnyj, *et al.***
Proposed method and device are intended for power generation, transmutation of radioactive wastes, burnout of weapon plutonium and actinides. Interaction of neutron beam coming from neutron generator is effected on lead matrix wherein nuclear fuel and radioactive wastes are distributed; then they are decelerated and bred in subcritical thermal core. Device implementing this method has its central target made in the form of lead matrix with nuclear fuel and radioactive wastes distributed therein.

**RU2343575**
**Method Of Long-Living Radionuclides Fixation For Storage And Transmutation**
**Inventor : V. Tikhonov, *et al.***
Long-living radionuclides are isolated from nitric acid solution of used nuclear fuel (UNF) into solid phase in form of acetates, oxides and other compounds, which do not contain elements strongly activated with neutrons. Radionuclides are imbedded and fixed in carbon matrix. Carbon matrix is obtained in process of carrying out reaction of metal acetates with excess of phthalonitryl and their further pyrolysis. For radionuclides isolated from UNF in form of oxides or other compounds, carbon matrix is obtained by their mixing with yttrium acetate, then synthesis and pyrolysis of yttrium diphthalocyanine are carried out. Operation of synthesis and pyrolysis of yttrium diphthalocyanine is carried out in inert atmosphere, pyrolysis is carried out at T=850-1100 DEG C.; Obtained carbon matrix does not contain elements strongly activated with neutrons, which allows using it both for long-term storage and for transmutation of long-living radionuclides without any chemical processing and additional operations.

**RU2156001**
**Radioactive Waste Processing Technique**
**Inventor : B. Taratorin, *et al.***
Radioactive wastes are placed in nuclear explosion zone of weapon plutonium wherein intensive neutron flux is allowed to pass through them to convert them to steam that condenses into particles measuring about 10-6 cm. Neutron flux and heat energy released due to explosion of weapon plutonium cause transmutation of nuclides in desired quantities and their separation into long- and short-living ones in condensed state from steam by centrifuging. Proposed technique provides for using products of explosion to produce electrical energy and transuranium elements.

**CN101325092**
**Solution stack for burning plutonium and transmutation of neptunium-237 or americium-241**
**Inventor : W. Yinghua, *et al.***
The invention discloses a solution reactor used for the plutonium combustion and the neptunium-237 or the americium-241 transmutation. The solution reactor adopts plutonium or plutonium and americium in the spent fuel of the nuclear

power plant as the fuel, and adopts neptunium-237 or americium-241 as the target. By adopting the solution reactor, the minor actinides which have long half life and high toxicity and can not be stored for a long time, such as the neptunium-237 or the americium-241, can be changed into nuclides with short half life and low toxicity through transmutation. Because the solution reactor adopts the spent fuel and can generate electricity at the low temperature, the cost-effectiveness and the security are high; the neutron provided by the plutonium combustion can extract plutonium-238 from the neptunium-237 solution target as the isotope battery, thereby the inexpensive energy is provided; the americium-242 extracted from the americium-241 solution target can be widely applied to the aerospace industry and the medical industry

**US2008240330**
**Compact Device for Dual Transmutation for Isotope Production Permitting Production of Positron Emitters, Beta Emitters and Alpha Emitters Using Energetic Electrons**
**Inventor : C. Holden**
A method and apparatus for directing high energy electrons to a converter material that emits gamma rays, which, in turn interact directly with parent isotopes to produce unstable, short-lived medical isotopes and product isotopes by the gamma, n reaction, or which interact with high-z materials to produce neutrons that then produce valuable isotopes by neutron capture in parent isotopes.

**AU2001297883**
**Method and apparatus for the transmutation of nuclear waste with tandem production of tritium**
**Inventor : El-Sharawy, *et al.***
The transmutation of radioactive material using a hybrid transmutation reactor is disclosed wherein a kinetic proton source is used to collisionally induce the transmutation of radioactive material with the generation of thermal neutrons as a byproduct. Additionally, a system and method for the production of Tritium utilizing the thermal neutrons generated in the transmutation process is further described. The present invention offers advantages and improvements over existing nuclear reactor technologies in that nuclear waste may be rendered inert, or otherwise at least partially deactivated and/or made less dangerous, with the substantially simultaneous production of energy and/or Tritium as a byproduct of the transmutation process.

**US2009135981**
**Element Transmutation Method And Energy Generation Method**
**Inventor : N. Yabuuchi**
Deuterium nuclei are coordinated at vertical angle positions of each face constituting a regular hexahedron, inside a metallic crystal. Electrons are coordinated to the other vertical angle positions. By Coulomb attraction acting between four protons and four electrons, four deuterium nuclei are fused to

transmute into two helium atoms

**US6442226**
**Accelerator-driven transmutation of spent fuel elements**
**Inventor : F. Venneri*, et al.***
An apparatus and method is described for transmuting higher actinides, plutonium and selected fission products in a liquid-fuel subcritical assembly. Uranium may also be enriched, thereby providing new fuel for use in conventional nuclear power plants. An accelerator provides the additional neutrons required to perform the processes. The size of the accelerator needed to complete fuel cycle closure depends on the neutron efficiency of the supported reactors and on the neutron spectrum of the actinide transmutation apparatus. Treatment of spent fuel from light water reactors (LWRs) using uranium-based fuel will require the largest accelerator power, whereas neutron-efficient high temperature gas reactors (HTGRs) or CANDU reactors will require the smallest accelerator power, especially if thorium is introduced into the newly generated fuel according to the teachings of the present invention. Fast spectrum actinide transmutation apparatus (based on liquid-metal fuel) will take full advantage of the accelerator-produced source neutrons and provide maximum utilization of the actinide-generated fission neutrons. However, near-thermal transmutation apparatus will require lower standing inventories of plutonium and higher actinides. Uranium, presently the largest volume constituent in nuclear waste, is fully utilized and not discharged as waste. Since no plutonium, higher actinides or fission products are present in the reconstituted fuel elements, the present processes can be used repeatedly. Since the performance of the existing reactors is not changed, full utilization of both thorium and uranium resources is achieved.

**US6738446**
**System and method for radioactive waste destruction**
**Inventor : F. Venneri, *et al.***
A method for transmuting spent fuel from a nuclear reactor includes the step of separating the waste into components including a driver fuel component and a transmutation fuel component. The driver fuel, which includes fissile materials such as Plutonium<239>, is used to initiate a critical, fission reaction in a reactor. The transmutation fuel, which includes non-fissile transuranic isotopes, is transmuted by thermal neutrons generated during fission of the driver fuel. The system is designed to promote fission of the driver fuel and reduce neutron capture by the driver fuel. Reacted driver fuel is separated into transuranics and fission products using a dry cleanup process and the resulting transuranics are mixed with transmutation fuel and re-introduced into the reactor.; Transmutation fuel from the reactor is introduced into a second reactor for further transmutation by neutrons generated using a proton beam and spallation target.

**JP2007322202**
**Method, Device And Program For Predicting Nuclear Reaction In Flocculation System, And Method For Detecting Substance After Nuclide**

**Transmutation**
**Inventor : I. Takehiko*, et al.***
In the method for predicting the nuclear reaction in the flocculation system, where a substance which is subjected to nuclide transmutation is placed in contact with a structure in the flocculation system and deuterium is made to flow into it to induce nuclear reaction in the substance which is subjected to nuclide transmutation; a substance where 2n (n is a natural number) is added to both the atomic number and the mass number, respectively of the substance to which nuclide transmutation is given is predicted as being the substance to be generated after the nuclide transmutation.

**WO2006005813**
**Method And Device For Transmutation Of Nucleons Free Of Prior Or Permanent Plasma**
**Inventor : G. Vitrac**
The invention concerns a method and a device for transmutation of nucleons free of prior or permanent plasma to provide particles whereof the kinetic energy is quantified for resonance of the active section for specialized application. The exact distribution results from vector compositions of quanta generated by structural piezoelectric actuators and spin inducers. The fusion is then obtained by activation ad minima tunnel effect. The economy and reliability of the system are linked to the programming of quantum models representative of discrete cycles, and the minimized supply of reagents with stage-recycling possibilities, and annihilations, while promoting the option of low level radiation. Various fields of application concern said inventive mini-reactor such as radiochemistry, medical imaging and non-destructive controls, selection and treatments of waste.

**US2004047443**
**Electron capture by magnetic resonance**
**Inventor : E. Bondoc**
The process of capturing electron by subjecting proton to magnetic resonance until its magnetic moment is in opposite direction relative to the electron's magnetic moment. As soon as the particles' magnetic moments are opposite in direction, spinlocking technique is applied for a period of time to induce transmutation of the particles and the consequent reactions of the product with an adjacent particle or a group of particles and the release of energy.

**US2007297554**
**Method And System For Production Of Radioisotopes, And Radioisotopes Produced Thereby**
**Inventor : E. Lavie, *et al.***
A system and method for the production of radioisotopes by the transmutation of target isotopic material bombarded by a continuous wave particle beam. An ion source generates a continuous wave ion beam, irradiating an isotope target, which is cooled by transferring heat away from the target at heat fluxes of at least about 1 kW/cm<2>.

**US2003016774**
**Method and apparatus for stimulated beta decays**
**Inventor : R. Santilli**
Method for the synthesis of neutrons from protons and electrons comprising apparatus for said protons and electrons to have a threshold relative energy of about 0.80 MeV, for said protons and electrons to be in anti-parallel coupling, and for forcing said protons and electrons in anti-parallel coupling to be at a mutual distance essentially of one Fermi. Another embodiment includes a method for the stimulated decay of a peripheral neutron in a nucleus. Another embodiment includes apparatus for the stimulated beta decay of a natural isotope into another natural isotope, the latter having the same number of nucleons of the former and one additional proton, wherein the conservation of total energy, angular momentum and parity are satisfied. Another embodiment includes apparatus for the stimulated beta decay of radioactive waste.

**US8373087**
**A Plasma Torch for Use in a Waste Processing Chamber**
**Invnetor : V. Gnedenko, *et al.***
The invention is a plasma torch for insertion through an opening in the wall of a waste processing chamber. The plasma torch of the invention is characterized by comprising a coaxial sleeve having an upper end and a lower end. The sleeve surrounds at least the portion of the outer surface of the torch that is located in the opening, thereby forming an insulating chamber between the outer surface if the torch and the inner surface of the sleeve. At least a portion of the portion of the coaxial sleeve that surrounds at least the portion of the outer surface of the torch that is located in the opening in the wall of the processing chamber is porous or permeable to a heat exchanging fluid. The torch comprises an inlet for introducing the heat exchanging fluid into the insulating chamber. When the plasma torch is inserted through the opening, a gap exists between the processing chamber wall and the coaxial sleeve. Thus the coaxial sleeve and the insulating chamber shield the outer surface of the plasma torch from a significant amount of the heat that radiates from the processing chamber wall and from inside the processing chamber and the heat exchanging fluid that flows through the inlet exits the insulating chamber into the processing chamber.

**US8090072**
**Neutron-driven element transmuter**
**Inventor : C. Rubbia**
A material is exposed to a neutron flux by distributing it in a neutron-diffusing medium surrounding a neutron source. The diffusing medium is transparent to neutrons and so arranged that neutron scattering substantially enhances the neutron flux to which the material is exposed. Such enhanced neutron exposure may be used to produce useful radioisotopes, in particular for medical applications, from the transmutation of readily-available isotopes included in the exposed material. It may also be used to efficiently transmute long-lived

radioactive wastes, such as those recovered from spent nuclear fuel. The use of heavy elements, such as lead and/or bismuth, as the diffusing medium is particularly of interest, since it results in a slowly decreasing scan through the neutron energy spectrum, thereby permitting very efficient resonant neutron capture in the exposed material.

**JP2005062025**
**Method For Increasing Nuclear Transmutation Quantity From Nuclear Transmutation Device And Nuclear Transmutation Device**
**Inventor : M. Sakano, *et al.***
With this method, a nuclear transmutation quantity from a nuclear transmutation device is increased by a process for applying electrolysis process or plasma treatment to a surface of a structure including a hydrogen occlusion metal, and adding a material causing nuclear transmutation to the surface

**WO2008041254**
**Apparatus and Process for the Production of Neutrons by Means of Ultrasound and the Cavitation of Substances**
**Inventor : F. Cardone**
The invention relates to an apparatus and a process for the production of neutrons in doses which are not dangerous for living beings, starting from stable elements by means of insonation or sonication using an electromechanical transducer, called a sonotrode-cavitator, characterized in that said electromechanical transducer comprises a stack of piezoelectric elements mechanically connected to a sonotrode of such a size as to operate at its own resonance frequency as a function of the electrical activation energy applied to said piezoelectric elements. The process is conducted in the liquid phase, preferably in the presence of iron ions at atmospheric pressure in an open environment to make the bubbles naturally present in the liquid phase implode.

**WO2008041255**
**Process and Plant for the Production of Endothermic and Exothermic Piezonuclear Reaction by Means of Ultrasounds and the Cavitation of Substances**
**Inventor : F. Cardone**
The invention relates to a process and plant for the production of endothermic and exothermic piezonuclear reactions by means of ultrasounds and the cavitation of substances. The plant comprises in sequence a storage tank for the working liquid containing an active medium in solution and/or in suspension, said storage tank being connected up to a cavitation chamber in which the piezonuclear reactions take place. In the case of exothermic reactions, there is production of vapour under high pressure, which is then conveyed to a turbine for the production of mechanical energy or electrical energy by means of an alternator or equivalent; the process is accompanied by the secondary phenomenon of production of material different from that making up the working liquid. In the case of endothermic reactions, there is consumption of electrical energy for the

generation of piezonuclear reactions that produce substances regarded as useful starting from the working liquid available.

**WO2008041253**
**Apparatus and Process for the Quenching of Radioactivity...**
**Inventor : F. Cardone**
The invention relates to an apparatus and a process for reducing the radioactivity of natural and/or artificial elements through piezonuclear reactions generated by means of insonation or sonication using an electromechanical transducer. The apparatus is characterised in that said electromechanical transducer comprises a stack of piezoelectric elements mechanically connected to a sonotrode of such a size as to operate at its own resonance frequency as a function of the electrical activation energy applied to said piezoelectric elements, to obtain the cavitation of the bubbles present in the liquid in which the radioactive substances are to be placed.

**US6233299**
**Assembly for transmutation of a long-lived radioactive material**
**Inventor : T. Wakabayashi**
A new transmutation assembly permits an efficient transmutation of a long-lived radioactive material (long-lived FP nuclides such as technetium-99 or iodine-129) which was produced in the nuclear reactor. Wire-type members of a long-lived radioactive material comprised of metals, alloys or compounds including long-lived FP nuclides are surrounded by a moderator material and installed in cladding tubes to form FP pins. The FP pins, and nothing else, are housed in a wrapper tube to form a transmutation assembly. The wire-type members can be replaced by thin ring-type members. The transmutation assemblies can be selectively and at least partly loaded into a core region, a blanket region or a shield region of a reactor core in a fast reactor. From a viewpoint of reducing the influence on the reactor core characteristics, it is optimal to load the transmutation assemblies into the blanket region.

**US6233298**
**Apparatus for transmutation of nuclear reactor waste**
**Inventor : C. Bowman**
A subcritical reactor-like apparatus for treating nuclear wastes, the apparatus comprising a vessel having a shell and an internal volume, the internal volume housing graphite. The apparatus having means for introducing a fluid medium comprising molten salts and plutonium and minor actinide waste and/or fission products. The apparatus also having means for introducing neutrons into the internal volume wherein absorption of the neutrons after thermalization forms a processed fluid medium through fission chain events averaging approximately 10 fission events to approximately 100 fission events. The apparatus having additional means for removing the processed fluid medium from the internal volume. The processed fluid medium typically has no usefulness for production of nuclear weapons.

**US5160696**

**Apparatus for nuclear transmutation and power production using an intense accelerator-generated thermal neutron flux**

**Inventor : C. Bowman**

Apparatus for nuclear transmutation and power production using an intense accelerator-generated thermal neutron flux. High thermal neutron fluxes generated from the action of a high power proton accelerator on a spallation target allows the efficient burn-up of higher actinide nuclear waste by a two-step process. Additionally, rapid burn-up of fission product waste for nuclides having small thermal neutron cross sections, and the practicality of small material inventories while achieving significant throughput derive from employment of such high fluxes. Several nuclear technology problems are addressed including 1. nuclear energy production without a waste stream requiring storage on a geological timescale, 2. the burn-up of defense and commercial nuclear waste, and 3. the production of defense nuclear material. The apparatus includes an accelerator, a target for neutron production surrounded by a blanket region for transmutation, a turbine for electric power production, and a chemical processing facility. In all applications, the accelerator power may be generated internally from fission and the waste produced thereby is transmuted internally so that waste management might not be required beyond the human lifespan.

**US5848110**

**Method and apparatus for transmutation of atomic nuclei**

**Inventor : J. Maenchen, *et al.***

The present invention addresses the problems outlined above. An accelerator based on a combination of a high repetition rate high energy pulsed power supply (RHEPP) and a magnetically-injected anode plasma (MAP) source diode is used to provide pulsed particle beams having intermediate energy (0.2-20 MeV) and average power levels of hundreds of kilowatts to megawatts. This will increase the rate of isotopic production by 2-3 orders of magnitude over processes based on conventional accelerators. Any gaseous ion can be accelerated with this technology (proton, deuteron, and helium beams are of special interest). This capability can be applied to transmute target nuclei selectively into desired isotopes. RHEPP/MAP accelerators are also extremely power efficient and relatively small in size, making application of small units practical in, for example, major local or regional medical facilities. Finally, the use of relatively low beam particle energies reduces or eliminates the problem of undesired products and the subsequent generation of radioactive waste. Although the invention is being discussed in terms of embodiment via the RHEPP/MAP system, any pulsed ion beam generator having sufficient ion kinetic energy and total average beam current can be used in the same manner.

**US4961880**

**Electrostatic Voltage Excitation Process and Apparatus**

**Inventor : W. Barker**

Accelerated decay of radioactive materials is used for power production. In the method of this invention an alpha-emitting radioactive material is placed in a region. The region is selected so that when a negative potential is applied to the region, enhanced alpha decay of the radioactive material results. The energy of the alpha decay particles is captured and converted to thermal energy.

**US5076971**
**Method for Enhancing Alpha Decay in Radioactive Materials**
**Inventor : W. Barker**
Apparatus and method for decontaminating radioactive materials by stimulating the atomic system of radioactive materials. The stimulus is kept applied to the radioactive materials for a predetermined time. In this way, the rate of decay of the radioactivity of the materials is greatly accelerated and the materials are thereby decontaminated at a rate much faster than normal. The stimulus can be applied to the radioactive materials placing them within the sphere or terminal of a Van de Graaff generator and allowing them to be subjected to the electrical potential of the generator, such as in the range of 50 kilovolts to 500 kilovolts, for at least a period of 30 minutes or more.

**US2003138068**
**Method for Transmutation of Long-Living Radioactive Isotopes into Short-Living or Stable Ones**
**Inventor : V. Buttsev, *et al.***
Transmutation of long-living radioactive isotopes into short-living or stable ones is conducted under the action of electromagnetic radiation. In the process, highly ionized atoms with energy- resolved hole of accelerated beta-decay are produced from atoms of long-living radioactive isotope and held in ionized state until transmutation of mother nuclei to daughter short-living or stable ones takes place. With coefficient of operating time k preset for daughter nuclei, atoms of long-living radioactive isotope are held in highly ionized state for at least time beta, where beta is lifetime of mother nuclei under accelerated beta-decay conditions. Electromagnetic radiation may be effected by beams of accelerated charged particles (electrons, protons, or ions) or by photon flux. Radiation by charged-particle beam may be combined with photonflux radiation. Effect: enhanced transmutation efficiency dispensing with nuclear reactions of collision character and avoiding formation of by-products.

**US2002186805**
**Accelerated Radioactivity Reduction**
**Inventor : S. Soloway**
A method for reducing radioactivity in a radioactive sample is disclosed, comprising contacting said sample with a beam of photons, said beam having an energy level sufficient to cause said radioactive sample to emit particles including photons in an amount sufficient to accelerate a reduction in radioactivity of said sample. Also disclosed is a method of increasing radioactive decay in a radioactive isotope comprising the steps of: determining a beam of an effective energy and effective flux of photons to increase radioactive decay in the

radioactive isotope; applying the beam to the radioactive isotope; and maintaining the beam for an amount of time effective to increase the radioactivity of the radioactive isotope.

**US20040238366**
**Method and System with Apparatus for Acceleration of Activity Decrease and Radioactive Material Deactivation**
**Inventor : A. Vladimirovich, *et al.***
Radioactive material can be processed by an apparatus that includes at least a cylindrical outer shell electrode, an inner electrode, and a plurality of prism-shaped ferromagnetic elements positioned between the outer and inner electrodes. The prism-shaped ferromagnetic elements are positioned around the inner circumference of the metal cylinder. The inner electrode component is located within the metal cylinder and is configured to cover the inwardly-pointing portions of the prism-shaped ferromagnetic elements. Radioactive material in a container is placed into the apparatus, and an AC voltage excitation signal is applied to the electrodes of the apparatus during treatment of the material. The frequency of the excitation signal is selected according to the frequency of structurization or the frequency of destructurization of the ferromagnetic material. The process can be monitored and controlled with the use of alpha, beta, and gamma radiation intensity measuring instruments.

**About the Author : Robert A. Nelson** is the founder of Rex Research ( http://www.rexresearch.com ), established in 1982 to archive and disseminate information about suppressed, dormant, and emerging technologies and related subjects. He is a 10th grade dropout with no credentials.