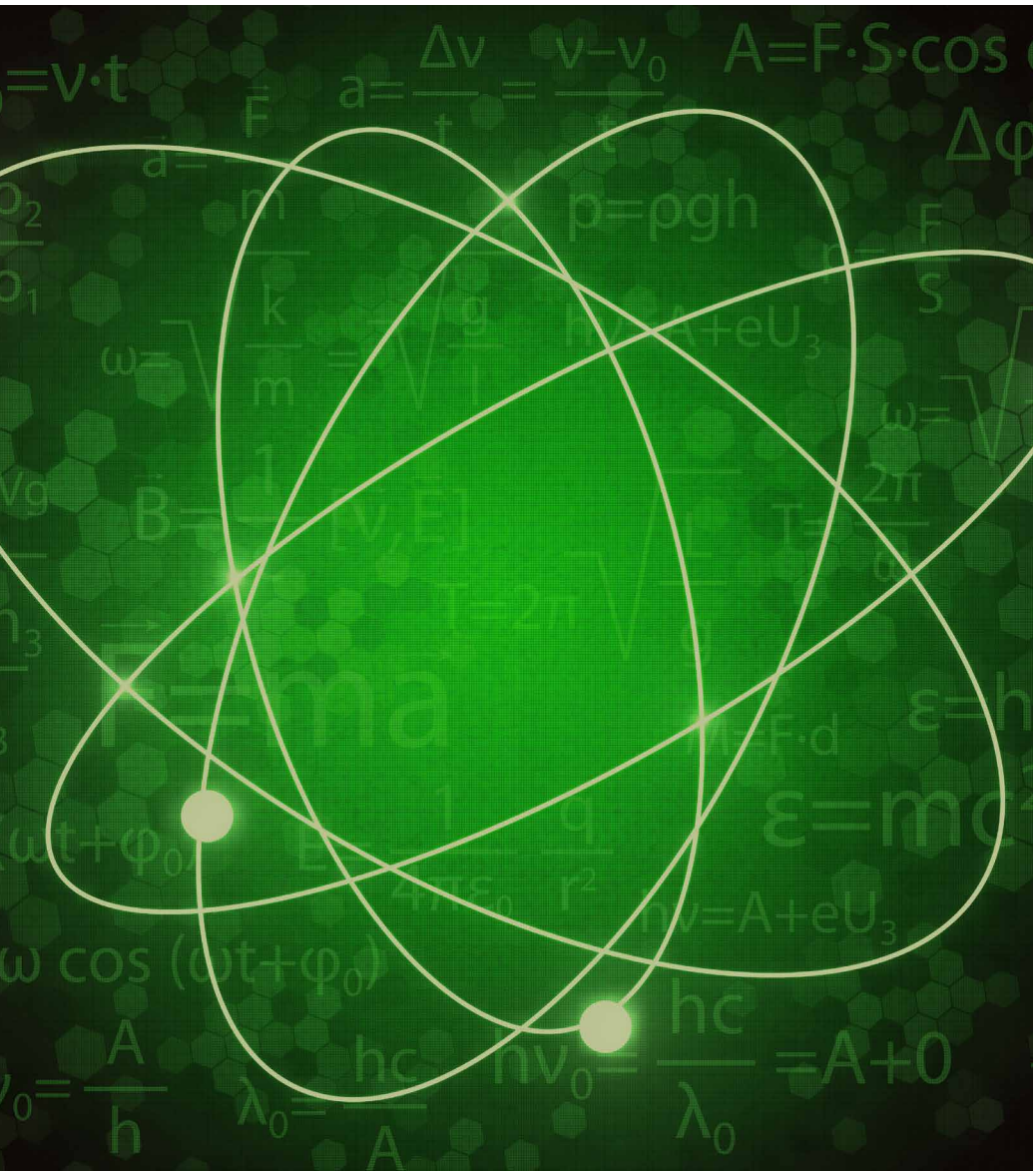
ANS Annual Meeting

2019

Preview Program

THE VALUE OF NUCLEAR

June 9-13, 2019
Minneapolis, MN, USA
Hyatt Regency Minneapolis



Technical Sessions: Monday June 10

MONDAY, JUNE 10
TECHNICAL SESSIONS - 1:00 PM

The WIPP-20th Anniversary–Panel
Sponsored by FCWMD. **Session Organizer:** Jean-Francois Lucchini *(LANL)*

The Waste Isolation Pilot Plant (WIPP) has been disposing of defense-generated legacy transuranic (TRU) waste since March 1999. In 20 years, more than 90,000 cubic meters contact-handled and 350 cubic meters of remote-handled TRU waste have been stored 2,150 feet below ground, cleaning up 22 generator sites nationwide. Presentations in this panel session will celebrate the 20th anniversary of WIPP, the nation's first and only operating deep geologic repository for radioactive wastes.

Panelists
Todd Shrader *(DOE)*
Other panelists to be announced.

Isotopes and Radiation: General
Sponsored by IRD. **Session Organizer:** Igor Jovanovic *(Univ of Michigan)*

Niowave's Domestic Radioisotope Production from Uranium and Radium, Amanda K. Grimm, Chase H. Boulware, Terry L. Grimm, William A. Peters, Mike A. Zamiara *(Niowave, Inc.)*

Efficiency Optimization of a Positron Moderator Foil, Raed Alsulami, Mubarak Albarqi *(Missouri Univ Sci Technol)*, Safwan Jaradat *(Higher Colleges of Technology,)*, Joseph T. Graham, Shoaib Usman *(Missouri Univ Sci Technol)*

Neutron Depth Profiling Measurement for Borophosphosilicate Glass (BPSG), Mubarak Albarqi, Raed Alsulami, Joseph T. Graham *(Missouri Univ Sci Technol)*

Isotopic Transmutation by Heavy Electron Catalysis, Thomas J. Dolan *(Univ of Illinois)*, Anthony C. Zuppero (*Tionesta Applied Research Corp)*

Application of Pb Isotopes in Uranium-Cobalt Mineralization, Manny Mathuthu *(North-West Univ)*

Data-Driven Methodology for Predicting Isotope Production at Material Testing Reactors, Jorge Navarro *(ORNL)*

Experimental Thermal Hydraulics—I
Sponsored by THD. **Session Organizer:** *Xiaodong Sun (Univ of Michigan)*

Turbulent Flow Measurements of the Under-Expanded Free Jet and Jet Impinging on a Flat Surface, Duy-Thien Nguyen, Blake Maher, Camila F. Matozinhos, Gabriel C. Q. Tomaz, Yassin Hassan *(Texas A&M)*

Temperature Measurements in Sub-Cooled Boiling Using Laser Induced Fluoresce Technique (LIF), Bandar A. Alkhudhiri, Yassin Hassan *(Texas A&M)*

Temperature Measurement of Direct Contact Condensation of Steam Using Backlight Aided LIF, Joseph Seo, Sero Yang, Yassin A. Hassan *(Texas A&M)*

Facility for Simulating Transient Boiling Behavior Under PWR Conditions, Colby B. Jensen, Charles P. Folsom, Nicolas Eric Woolstenhulme, Nicholas Smith *(INL)*, Kevin Joe Terrill, Richard N. Christensen *(Univ of Idaho)*

Experimental Research of Jet Diameter on Heat Transfer in a Small Steel Containment, Shengfei Wang *(North China Electric Power Univ)*, Yusheng Liu *(Nuclear and Radiation Safety Center)*, Xiaowei Jiang *(The Reactor System Design Technology Laboratory)*

21st International Conference on Condensed Matter Nuclear Science

Abstracts

Colorado State University
Fort Collins, Colorado
3-8 June 2018

Organized by LENRIA

Transmutations by Heavy Electron Catalysis

Anthony C. Zuppero and Thomas J. Dolan

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Our model uses heavy electrons to facilitate nuclear reactions, similar to muon catalysis. The heavy electrons have lifetimes ~ 10 fs, during which some of them may facilitate nuclear transmutations. The model is described in a separate paper. Here we compare predictions of the model with various experimental observations.

(1) Reactions of light hydrogen with Ni^{62} and Ni^{62}. These are claimed to have produced 11% iron, 10% copper and lesser amounts of zinc and cobalt. (Bazhutov-2014)

(2) Reactions between LiAlH4 and natural nickel. These depleted Li^{7} and all Ni isotopes except Ni^{62}. The reaction created many isotopes, in approximately decreasing amounts: Fe, C, O, Cl, Si, and smaller amounts of Cr and Mn, and apparently no copper, cobalt or zinc. (Levi-2014)

(3) Electrolysis of thin (65 nm) Ni films in light water with 1 molar lithium sulfate. These reactions produced silver (Ag^{107} and Ag^{109}) as well as Fe, Cu^{63} and isotopes similar to observations (1) and (2) above. (Miley 1996)

(4) Exploded Titanium foil produced Fe, isotopes. High voltage and current pulse vaporized titanium foil in either light or heavy water, producing Fe, Ni, Cu, Zn, and Co. (Urutskoev-2004)

(5) Deuterium diffusing through Cs, Sr, Ba, and W films on Pd (Iwamura)

(6) The reaction products were in the ground state (non-radioactive). Energetic emissions associated with dd fusion were not observed, except possibly as tiny traces

(7) Liquid neon that was dissolved in the liquid H_2/liquid D_2 mixture prevented muon catalyzed fusion reactions.

8) Weighable amounts of new isotopes have been reported, with substantial excess heat.

9) Darkening of photographic plates. X-rays and low energy gamma (~ 200 keV) have been observed, but energetic particles emitted are apparently not charged, except for trace amounts.

Heavy electron catalysis may be useful for neutralizing Cs^{137} and Sr^{90}.

Electron Quasiparticle Catalysis of Nuclear Reactions

Anthony Zuppero and Thomas J Dolan
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Abstract

We present a model based entirely on known, conventional physical chemistry, solid state physics and muon catalyzed reaction physics, the combination predicting both the isotopes observed and the lack of known energetic emissions for a set of proton-nickel and related reactions. The model unifies the observation of a new reaction type recently discovered in surface catalysis and the observation of the cryogenic, chemically-induced fusion reactions of muon catalyzed fusion. Unification depends on the use of a third, negative particle between reactants having an effective mass above a threshold. A solid state physics discovery provides a transient, elevated effective mass electron quasiparticle created by simultaneous addition of electron energy and lattice crystal momentum for placing the quasiparticles near an inflection point of the band structure of the material, where effective mass diverges. Observations suggest in every case of anomalous isotope and energy emission a mechanism appears to exist to add such crystal momentum and energy, sufficient to raise the effective mass above a calculable threshold. Applications include transmuting radioactive waste into natural elements.