Fusion and Transmutation Energy Sources

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Abstract. The development of instrumentation in 20th century has enabled observation of several anomalies with respect to the energy balance in chemical reactions, driving strong suspicion that some kind of hitherto unknown nuclear reaction may be taking place. Over time researchers have associated various names with these anomalies, and over 1000 papers have been published, introducing over a hundred reaction models but without explaining the observed phenomena. The most recent research points to quantum nuclear reactions that are favored in nano-structures and drives to a nuclear reaction with a quantum state entanglement, similar to that obtained in quantum state teleportation. Here comes into play new physics that is sometimes seen to contradictory to current understanding. However, considering the history of science, this may be seen as a normal development that has appeared many times in the past, such as when Newtonian physics was complemented by Relativity, with no contradiction. Thus the current understanding of nuclear physics may be complemented by an understanding of nuclear reactions driven by assemblies of quantum states.

No matter how we explain the process, what is obvious in many experiments is that these strange nuclear reactions spontaneously occurring in chemical assemblies are producing significant amounts of energy, making possible new power sources for space applications.

Fusion and transmutation power sources rely on a chemical reaction to be able to generate in controlled manner active nuclear environments, where a low energy transition in a quantum assembly drives a high energy output, observed via charged particle and radiation emission. Some reactions emit no radiation, with all energy gradually being transferred to phonons and heating up the structure. The fusion of deuterium in palladium deuteride lattices is likely to enable in such nuclear energy conversion devices. The reaction produces an energetic alpha particle of about 22 MeV and a recoiled Palladium with about 0.3 MeV. Using a combination of electromagnetic fields it will be possible to produce a high density of active nuclear reaction sites a few nano-meters wide, which could deliver high power density or high temperature for power sources for space.

Conduct of the deuterium fusion reaction in a nickel-hydride structure may enable the transmutation of nickel atoms and of other elements, releasing several MeV per reaction. The devices presented are in early conceptual stage, TRL=3, and the R&D will apply many modifications to the current concepts until a reliable power source for space applications is obtained.

Keywords: fusion, transmutation, quantum-entanglement, active-nuclear-environment, power source.