Decay of $^{4}\text{He}^{*}\wedge$ from PdD and transmutation

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Present Lochon and Extended-Lochon Models for the low-energy nuclear reaction, LENR, fusion process predict the fusion of monatomic deuterium into a sub-fragmentation level excited condition of $^{4}\text{He}^{*}\wedge$. The $\wedge$ and * indicate the presence of deep-Dirac level (DDL) electrons and of an excited nuclear state respectively. The higher angular-momentum deuterium combinations result in the formation of femto-deuterium molecules or molecular ions, $D_{2}\wedge$ or $D_{2}^{*}\wedge$. Both the $^{4}\text{He}^{*}\wedge$ and femto-deuterium molecules are expected to be short lived (<1fs). However, the short life may be determined more by their fusion with other nuclei than with their decay time to $^{4}\text{He}$.

The $^{4}\text{He}^{*}\wedge$ and femto molecules and ions would be highly mobile in the lattice because of their multi-femtometer size. However, because of the Coulomb barrier, the positively charged ion, $D_{2}\wedge$ or $^{4}\text{He}^{*}\wedge$, would not penetrate a nucleus as would the neutral $^{4}\text{He}^{*}\wedge$ and femto molecule. The positively charged ion would penetrate an atom’s electron cloud, but would interact with atoms as would a proton and form a short-lived ‘ordinary’ molecule, not a femto molecule.

The LENR fusion process for a $^{4}\text{He}^{*}\wedge$ or $D_{2}\wedge$ femto-atom or -molecule, with an atomic nucleus of mass $A$ and charge $Z$ could yield transmutation products ranging from $(A, Z-2)$, by weak-nuclear interaction from $(A, Z)$ absorbing one or two electrons to change protons to neutrons, to $(A+4, Z-2)$, absorbing the whole $^{4}\text{He}^{*}\wedge$ femto-atom. It can also form femto-deuterides, with $D_{2}\wedge$, or a femto-molecule, with $^{4}\text{He}^{*}\wedge$. As in the case for $^{1}\text{H}\wedge$ or $^{1}\text{H}_{2}\wedge$ femto-atoms or -molecules generated in NiH cold fusion, the large number of combinations possible is reduced by the stability ‘needs’ of the particular atomic nucleus with which the femto-atom/molecule fuses. There is sufficient energy in the process for the conversion of the DDL electron(s) and femto-atom or target-nucleus protons to form neutrons. There are sufficient ‘building blocks’ with which to ‘construct’ a stable nucleus from the fusion of almost any nucleus with $^{4}\text{He}^{*}\wedge$ or $D_{2}\wedge$. Because of the multi-body interaction, strong near-field radiation from tightly bound electrons, and low input energies, energetic particle emission from fusion with these femto-particles is much less common than for normal fusion or neutron-activation processes. The attraction of femto-atoms or -molecules to radioisotopes will reduce any radioactivity generated by transmutation of lattice nuclei and fusion with any natural, induced, or added, impurities.

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