Composite model for LENR in linear defects of a lattice

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Mathematical models for Low-Energy Nuclear Fusion (LENR) of hydrogen, H, and deuterium, D, are brought together in the context of over 20 years of searching for the answer to the source of nuclear fusion without the requisite kinetic energy to overcome a nuclear Coulomb barrier. The earliest of these models is Julian Schwinger's proposal [1] to combine, in a single Hamiltonian, the attractive nuclear potential with the repulsive Coulomb potential to reach an excited state of ^4He. The second was K.P. Sinha's 1999 model [2] to use the natural electron pairing to form charge-polarized $D^+ D^-$ pairs in a linear defect that is attractive rather than repulsive. Ed Storms' linear array of hydrogen 'atoms' in a gap or crevice in the lattice appears to combine Schwinger's and Sinha's concepts. Portions of other models, where applicable, are mentioned.

Another paper, to be presented in this conference, will provide a pictorial description of phonon activity in Sinha's linear array (and presumably Storms' also) of D or H atoms. The present paper concentrates first on a description of the many parameters and conditions necessary to solve the problem. (It will neither present nor solve the full equations.) The full Hamiltonian for the process must cover distances from the lattice spacing down to the nuclear force region. The different forces and frequencies involved in the various component interactions of the system vary greatly over this range of five orders of magnitude. The critical processes are mentioned along with their interdependencies. The importance of each model's contributions is highlighted. An appendix on mathematical modeling of the system provides more details and integration of the equations involved.

This model does not address all aspects of the LENR process, but it does lead to some of the mechanisms that can explain observed data. These include: a means of overcoming the nuclear coulomb barrier by linearizing and overlapping multiple bound atomic-electron trajectories along with the hydrogen sub-lattice; a means of dissipating nuclear energy to the lattice gradually, but before the protons actually are bound by their mutual nuclear forces; and a means of fusing deuterons into ^4He without ever occupying the excited states that fragment into the known 'hot' fusion products of protons, neutrons, tritium, and 3He, or energetic gamma rays. It also provides a means of forming hydrogen femto-molecules ($H_2(f)$, or perhaps even $H_n(f)$), as an alternative path for the p-e-p or p-e-e-p fusion to deuterium.

[1] Schwinger, J. "Nuclear energy in an atomic lattice," The First Annual Conference on Cold Fusion, Salt Lake City, Utah, 1990.

[2] K. P. Sinha, "Theoretical model for low-energy nuclear reactions in a solid matix," Infinite Energy vol. 29, pp, 1-4, 2000