Phonon-mediated excitation transfer involving nuclear excitation

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A few years ago we identified a relativistic mechanism for phonon-nuclear coupling [1] in connection with developing models for anomalies in Condensed Matter Nuclear Science. Since phonon energies are limited to less than 1 eV there is no possibility for single-phonon emission from an excited nuclear state in the keV range or higher. The lowest-order interaction which could give rise to observable effects is excitation transfer, in which the nuclear excitation is transferred to another nucleus sharing a common phonon mode.

Excitation transfer can produce delocalization and phase coherence, effects which are potentially observable in dedicated experiments. An unambiguous experimental result showing such an effect has the potential to prove the existence of the phonon-mediated nuclear excitation transfer, as well as to verify experimentally the existence of the phonon-nuclear coupling mechanism. Experiments are underway in our group to explore excitation transfer effects.

We have previously proposed that excitation transfer may be responsible for low-level energetic alpha and neutron emission in Fleischmann-Pons experiments [2]. Here we consider possible new experiments in which excitation transfer involving D_2/^{4}He and HD/^{3}He transitions to disintegrate nuclei, giving energetic alpha, proton and neutron signals that might be associated with specific excitation transfer reactions. If correct, such excitation transfer experiments would have the potential to allow for a study of mechanisms and specific reactions, and help shed light on what is going on in excess heat experiments.

[1] P. L. Hagelstein, "Quantum composites: A review, and new results for models for Condensed Matter Nuclear Science," J. Condensed Matter Nuclear Science, vol. 20, pp. 139-225, 2016.
[2] P. L. Hagelstein, "A unified model for anomalies in metal deuterides," Proc. ICCF9 pp. 121-134, 2002.