Nuclear Fusion in Muonic Molecules and in Deuterated Metals

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Study of the fusion reactions between hydrogen isotopes is essential for nuclear physics, astrophysics, plasma research, as well as to demonstrate the inadequacy of numerous attempts to realize the cold fusion. At LUNA installation the cross section measurements were extended to energies down to a few keV, that allowed observation of the screening by atomic electrons in a gas target. The information on reaction constants obtained from the muon catalysis research adds to progress in this field because in this case we can measure the nuclear fusion rates at zero energy collision. The μCF nuclear data will be reviewed and comparison with the recent "in-flight" measurements will be done.

The screening from free (unbound) electrons in dense plasma, which is of importance for astrophysical and thermonuclear research, is less investigated. The unique possibility is given by metal-hydrids - they are used as targets for *dd* experiments. Unexpectedly large screening potentials found for some metals [1] stimulated systematic research through the Periodic table of elements [2]. To interpret the results, many possible mechanisms were considered: thermal motion of atoms in the target, channeling, diffusion, conductivity, electron configuration, crystal structure, etc., but none succeeded. However, the classical plasma screening of Debye, applied to the quasi-free electrons in metal, could be a possible explanation.

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[1] U. Greife, F. Gorris, M. Junker, *et al.*, Z. Phys. **A351**, 107 (1995).
[2] F. Raiola, L. Gang, C. Bonomo, *et al.*, Eur. Phys. J.**A 19**, 283 (2004).