EFFECTS OF A THRESHOLD RESONANCE IN THE DD MIRROR REACTIONS STUDIED IN METALLIC ENVIRONMENTS

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Our experimental studies of the mirror reactions $^{2}H(d,n)^{3}He$ and $^{2}H(d,p)^{3}H$ in the energy range 5 keV – 60 keV applying different self-implanted deuterized metallic targets show that the neutron-to-proton branching ratio and the corresponding angular distributions depend on the target material. The results obtained for the transition metals Zr, Pd, Ta and Al do not differ from those known from gas target experiments. For the (earth) alkaline metals Li, Sr and Na at deuteron energies below 20 keV an enhancement of the angular anisotropy in the neutron channel and a quenching of the neutron-to-proton branching ratio by about 20% have been observed. This effect can be explained by contribution of a hypothetical 0^{+} threshold resonance which destructively interferes with reaction amplitudes. Calculations of reaction cross sections have been performed in the frame of constant T-matrix elements, assuming a d⊕d molecule structure of the threshold resonance and other known highly excited levels in ^{4}He. Consequences for the theory of the electron screening effect and nuclear reactions taking place in dense astrophysical plasmas will be discussed.