

Enhanced electron screening in alpha and beta decays

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Strongly enhanced electron screening of the Coulomb barrier between reacting nuclei has been recently observed in low-energy reactions preceding in metallic environments being a model for dense astrophysical plasmas. Since the alpha and beta decay probabilities depend on the penetration through the Coulomb barrier analogously to nuclear reactions, one might expect a dependence of decay half-lives on the electron density of the medium. On the other hand, it is argued that the screening of the Coulomb barrier can be cancelled due to an internal screening effect increasing the binding energy of a decaying nucleus. Here, we show that the strength of both effects is different because of the velocity dependence of the electron screening and thus a residual, rather weak influence of medium on radioactive decays should be experimentally observed. As motivation for future experimental studies, theoretical calculations comparing half-lives of alpha and beta decays in insulating and metallic environments will be presented.