

Electron screening: a review

M. Aliotta
School of Physics
University of Edinburgh, UK

Extensive studies of the electron screening effect in deuterated metals (55 metals) and other environments have been carried out in Bochum in recent years. Experimental results of anomalous enhancements have been interpreted in terms of the Debye plasma model applied to quasi-free metallic electrons.

The expected temperature dependence $U_e \propto T^{-1/2}$ has been verified and further supports the applicability of the Debye model. Within this model, the deduced number of valence electrons per metallic atom also agrees with the corresponding number from the Hall effect. For the $d(d,p)t$ reaction in metallic environments, the variation of hydrogen solubility in the samples as a function of temperature has also been measured, showing an anti-correlation with screening enhancement as expected [1].

Recently, ${}^7\text{Li}(p,\alpha)$ and ${}^6\text{Li}(p,\alpha)$ reactions have been investigated in Li insulators, Li metal and PdLi alloys. Preliminary results confirm the expected behaviour of the screening effect under the Debye model [2]. Indeed, the proposed model also accounts for the high screening potential ($U_e = 900 \pm 50$ eV) observed in previous studies of the reactions ${}^9\text{Be}(p,\alpha)$ and ${}^9\text{Be}(p,d)$ [3], which was not understood at the time. This further supports the expected Z_t scaling (with the metallic host) of the Debye model.

A review of all these results will be presented.

[1] F. Raiola et al.: European Physical Journal (2005) submitted [and references therein]

[2] J. Cruz et al.: (2005) in preparation

[3] D. Zahnw et al.: Z. Phys. A359 (1997) 211