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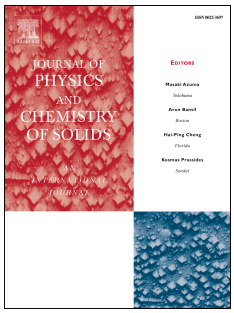

Modelling the contribution of semi-core electrons to the dielectric function

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Modelling the contribution of semi-core electrons to the dielectric function

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Abstract

Many aspects of the interaction of charged particles with matter can be expressed in terms of the dielectric function $\epsilon(q,\omega)$. The dielectric function is relatively well known in the optical limit ($q = 0$) but, for example, stopping power calculations require the knowledge of the dielectric function for $q \neq 0$. Several approaches have been used to extend the dielectric function to $q \neq 0$ for both the valence electrons, using variations of the Lindhard dielectric function and the core levels where an atomic description can be used. The intermediate case of shallow core levels is somewhat problematic. Here collective effects modify the atomic picture, and the hydrogenic approximation of the wave function is less accurate. In this paper we describe a new extension scheme of the contribution to the energy loss function of shallow core levels to $q \neq 0$ and show that tor Al and Si it describes the experimental stopping data somewhat better than previous approaches. It also describes reasonably well the proton and electron induced ionisation cross section of these