

ACTIVATION OF ELECTRONIC CONDUCTION IN SOLIDS BY DIPOLAR MOLECULES

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It is well known that the electronic conductivity of several semiconducting solids is greatly enhanced by the thermal generation of charge carriers from impurity levels of foreign atoms. We have found an analogous novel phenomenon involving foreign molecules in semiconductors and insulators. Several crystalline and molecular solids show much enhanced electronic conduction (electrons or holes) when doped with molecules of high dipole moment. This occurs in solids having free interstitial volume per unit cell, sufficiently large to accommodate the molecules. The enhancement of conductivity is explained as due to the reduction of the thermal activation energy of hopping conduction associated with the polarons, by the dipolar molecules. Experimental data on several molecular and crystalline solids doped with H_2O , HCN and HF is presented to show the quantitative agreement with the theoretical model.