Elastic interaction between dislocation and interface:Force image effect in the ceramic bimaterials (Al2O3-AlN)

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Abstract : The Al2O3and AlN materials are often used as electricalinsulators (electronic substrates) also the case of pressure sensorswhere the aluminum nitride (AlN) is selected as the piezoelectriclayer and the alumina (Al2O3) as a solid substrate insulating.In the absence of the effects of temperature, deformation andexternal stress, we are interested in this work to study themobility of dislocations near the heterophase interface ofbimaterials based alumina (Al2O3)under the effect of the imageForce. These dislocations having a Burgers vector b = 1/3 [11-20],. The interface is defined by its planeparallel to the dislocation line and disorientation varies between 0they are located in Al2O3and 180 ° around the axis [10-10]. The image force must becalculated in the context of the anisotropic linear elasticity usingthe theorem of Barnett and Lothe and the Stroh formalism. Fi = - E / d, E is the elastic interaction energy.The results show that dislocation motion under the image forceeffect depends on the elastic and crystallographic properties ofthe materials constituting the bicrystals and even disorientationof the interface which has an effect on the intensity of the elasticinteraction energy. The dislocations are repelled to the interfaceif the difference in shear modulus between the two materials ispositive 1>0), they are attracted to the interface in theopposite case 1<0).

Keywords : dislocations, Image Force, Peierls stress, elastic anisotropy