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The analysis of dislocations motion in aluminum with allowance for the Peierls potential relief

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It is well known that the motion of dislocation in aluminum takes the quantum regime at low temperatures. It is shown that the action of low temperatures is similar to the action of high Peierls barrier. For description of dislocation phenomena, we used the one-dimensional Frenkel-Contorova (FC) model and sine Gordon equation with and without friction. The (FC) dislocation in aluminum during overcoming Peierls's potential can be considered as topological soliton. The modelling of the dislocation motion process of quantum regime with real constants gives the possibility to investigate the nature of dislocations motion in the Peierls potential, to reveal his radical difference from free movement of dislocations. The theoretical assessment of possibility of the (FC) dislocation motion by means of tunneling is done. The modelling of fields of shifts, speeds and strain-stress dependence at motion of dislocation shows tunneling phenomenon. Thus, the theoretical calculation and mathematical simulation enables us to conclude that if the high Peierls barrier (or low temperatures) is taken into account, the (FC) dislocation is moving by way of kink tunneling. The received results explain abnormal reduction of tension of a plastic current in aluminum at low temperatures.

Biography

Arakelyan M M is working as a Senior Lecturer. She has graduated from the Yerevan State University, 1968 and completed her Post Graduate from Yerevan Teacher's Training College, 1970. She was a Candidate of Phys. Math. Sciences (PhD), Yerevan State University, 1979. Her research interests include: theory of solid state and semiconductor physics (low-dimensional electronic systems) and X-ray investigations of real crystals. Her subsidiary research interests include: theory of solitons. She was a Scientific Researcher from 1969 at Yerevan State University. She has 90 publications in repute journals.

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