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Mutual effect of ^{3}He impurities and Peierls potential on shear modulus softening in solid ^{4}He[1] D. ALEINIKAVA, E. DEDITS, A.B. KUKLOV, CSI, CUNY, D. SCHMELTZER, CCNY, CUNY — We investigate numerically dislocation crossover from quantum smooth to classically rough state in solid ^{4}He in presence of both - Peierls potential and ^{3}He impurities as pinning centers providing gaussian trapping potential. Monte Carlo simulations have been performed within the formalism [1]. ^{3}He is modeled as classical particles localized on dislocations according to thermal equilibrium with the bulk at some activation energy E_0, the ^{3}He total fraction x_3 as well as the dimensionless dislocation density $x_d << 1$ (in units of interatomic distance). It is shown that the softening of the shear modulus $\mu(T)$ observed in Ref.[2] cannot be explained within the simple ^{3}He evaporation model under the assumption of zero Peierls potential: for realistic E_0, x_3 and x_d the temperature range over which the softening occurs is much narrower, $\approx E_0/\ln(x_d/x_3^2)$ (where $x_3 \sim x_d$), than the one observed in [2]. Inclusion of the Peierls potential smoothens out the crossover and allows good fit of the data [2].

[1] D. Aleinikava, E. Dedits, A. B. Kuklov, D. Schmeltzer, arXiv:0812.0983
[2] J. Day and J. Beamish, Nature **450**, 853(2007).

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