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Dependence of the Strain Rate Sensitivity of Crystalline Materials on the Distribution of Obstacles to Dislocation Motion RENGE LI, ZHIJIE XU, CATALIN PICU, Rensselaer Polytechnic Institute — The strength and strain rate sensitivity of metals is usually described in terms of the concentration of obstacles to dislocation motion, i.e. the mean of the obstacle spatial distribution function. In this study we investigate the role of higher moments of this distribution function on these parameters. It is shown that large local fluctuations of obstacle density influence to a large extent the strain rate sensitivity of the material, while the effect on the strength (critical resolved shear stress) is smaller. It is shown that a large reduction of the strain rate sensitivity is associated with a change in the dislocation motion mode from smooth to jerky. Populations composed from obstacles of same strength but different activation energy, as well as obstacles of same activation energy and different strength are also studied.

Catalin Picu
Rensselaer Polytechnic Institute

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