

Pattern formation in indentation tests

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Indentation tests are used to explore incipient plasticity in crystals. The tip of scanning tunneling microscopes (STM) or atomic force microscopes (AFM) are used as indenters. Different types of dislocation patterns are observed around the indentation marks. We develop a toy model of dislocation nucleation in two dimensional indentation tests [1] which explains dislocation formation in terms of bifurcations. A similar phenomenon is observed in homogeneous nucleation tests [2]. Dislocation motion after nucleation is related to depinning phenomena [3, 4, 5] and formation of travelling waves [6, 7, 8]. Three dimensional discrete elasticity models provide a framework to simulate dislocations nucleation and motion using adequate nonreflecting boundary conditions at artificial boundaries [9, 10]. Once large numbers of dislocations are created continuum models [7, 11, 12] allow us to understand their interaction.

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