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Stability of Ideal Infinite Crystal Under Finite Uniform Deformation

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Strong deformation and fracture are very difficult to describe using macroscopic continuum methods. Lack of a material continuousness makes description of such processes to be a serious challenge. In the current paper the onset of the material fracture is studied from both micro- and macroscopic points of view. First an ideal infinite crystal lattice is considered. Transfer from microstructure to continuum mechanic is made using long-wave approximation. This allows obtaining nonlinear continuum equations of the infinite crystal under finite uniform deformation. These equations are found without limitation to the space dimension. For the stability verification a small deformation is superposed to a finite deformation of the crystal lattice being described by the obtained nonlinear macroscopic equations. Criterions of the material stability and their relevance to the crystal structure are obtained.

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