Materials Science Forum 2016 vol.870, pages 253-258

Dislocation structure evolution during plastic deformation of low-carbon steel

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Abstract

© 2016 Trans Tech Publications, Switzerland.The paper analyzes the regularities of structure formation in low-alloyed carbon steels. During the investigation of ferritic-pearlitic steel samples it has been found that the structure formation in pearlite essentially lags behind structural changes in ferrite grains, and this delay is observed at all stages of deformation. An important feature of structure formation in pearlite is crack nucleation in cementite, accompanied by dislocation pile-up in the ferrite interlayers of pearlite. Using the method of dislocation dynamics, the relationship between structural transformations and the parameters of strain hardening is analyzed. It is demonstrated that the proposed method of computer analysis reflects well the processes taking place in a material during plastic deformation. The character of the theoretical curve of strain hardening is determined by the dislocation structure that forms in a material at various stages of deformation.

http://dx.doi.org/10.4028/www.scientific.net/MSF.870.253

Keywords

Cementite, Evolution of dislocation structure, Ferritic, Low-alloyed carbon steels, Method of dislocation dynamics, Pearlitic, Strain degree, Strain hardening