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Collective Migration of Low-Angle Tilt Boundaries Near Crack Tips in Nanocrystalline Metals Under Fatigue Load

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Abstract. A model is suggested that describes the collective migration of two low-angle tilt boundaries near a crack tip in a nanocrystalline metal under fatigue loading. The dependences of the migration mode on the applied load and the geometric parameters of the migrating boundaries are revealed. The simulations show that the possible migration modes incorporate the reverse motion of grain boundaries (GBs), GB fragmentation, and the coalescence of low-angle GBs or their fragments with high-angle GBs. It is demonstrated that at high values of the applied load, the collective migration of the studied boundaries can lead to grain growth.

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