Constraint Effect on the Brittle-to-Ductile Transition of Single-crystal Iron Induced by Dislocation Mobility

Yang Li , Xiaobo Ren , Jianying He , Zhiliang Zhang

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Highlights

- A dislocation mobility based continuum model is employed.
- The change of the stress distribution ahead of crack tip due to the T-stress dictates the fracture toughness in the transition region.
- Lower constraint leads to a higher fracture toughness, a smoother transition curve and a lower critical transition temperature.
- A quantitative relation between fracture toughness and T-stress is established such that the transition curve with constraint can be estimated from a reference BDT curve.