Internal Friction of Steel: A Microstructural Perspective

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Abstract

Internal friction of a metallic material, such as low carbon steel in the present study, depends on a variety of microstructural parameters. The latter include nature and concentration of interstitials, crystallographic orientation, presence of dislocations and residual stresses, etc. This study used tailored microstructures, and bulk plus local internal friction measurements, to establish clear experimental linkage between microstructure and internal friction responses. As several microstructural variables often affect the anelasticity, our study was extended to multiscale atomistic modelling. Combined Kinetic Monte Carlo (KMC), molecular dynamic (MD) and molecular static (MS) simulations, on bcc single crystals, were conducted to decouple the role of individual microstructural parameters. A realistic match between experiments and numerical simulations helped us in expanding the subject of internal friction or anelasticity to a clear microstructural perspective.

Keywords: *Internal Friction, Microstructure, Multiscale Atomistic Modelling, Crystallographic Texture, Residual Stress.*

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