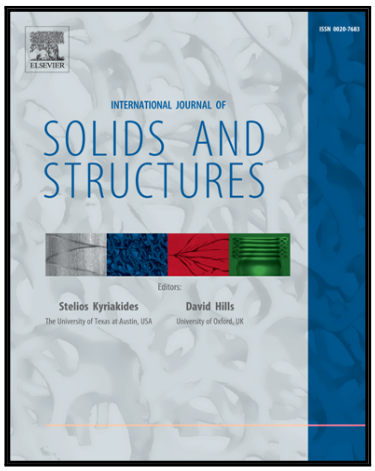

Atomic-Scale Mutual Integrals for Mixed-Mode Fracture: Abnormal Fracture Toughness of Grain Boundaries in Graphene

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Highlights

- A numerical calculation based on atomic-level J-based mutual integral is developed to extract the individual stress intensity factors.
- The individual stress intensity factors are calculated to quantitatively characterize the fracture behaviour of grain boundaries in graphene.
- The correlation between the fracture toughness and the density of defects is found.
- The fracture toughness of GBs in graphene is abnormally low under high mode mixity.

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