Elastic interaction of partially debonded circular inclusions. II. Application to fibrous composite - DTU Orbit (29/12/2018)

Elastic interaction of partially debonded circular inclusions. II. Application to fibrous composite

A complete analytical solution has been obtained of the elasticity problem for a plane containing periodically distributed, partially debonded circular inclusions, regarded as the representative unit cell model of fibrous composite with interface damage. The displacement solution is written in terms of periodic complex potentials and extends the approach recently developed by Kushch et al. (2010) to the cell type models. By analytical averaging the local strain and stress fields, the exact formulas for the effective transverse elastic moduli have been derived. A series of the test problems have been solved to check an accuracy and numerical efficiency of the method. An effect of interface crack density on the effective elastic moduli of periodic and random structure FRC with interface damage has been evaluated. The developed approach provides a detailed analysis of the progressive debonding phenomenon including the interface cracks cluster formation, overall stiffness reduction and damage-induced anisotropy of the effective elastic moduli of composite.

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