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# Abstracts


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# Estimating crack density tensors and change in the effective elastic and conductive properties of materials from the crack traces in 2D cross-sections

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The effect of cracks on the effective elastic and conductive properties of materials is expressed in terms of the 3D crack density parameter. Usually, this parameter is defined for circular (penny-shaped) cracks; it is a scalar in the case of random crack orientations and a tensor in anisotropic cases of non-random orientations. However, it may be difficult to estimate this parameter experimentally. In the present work, its estimations from the 2D density of line traces of cracks observed on a surface (say, specimen faces or tomography images) are derived in simple forms, both for isotropic case of random crack orientations and anisotropic case of systems of parallel cracks. This allows estimates of the said effective properties directly from the crack traces on specimen faces. The derived estimates should be treated as the mathematical expectations of the corresponding parameters. The obtained 2D–3D relations are verified by direct numerical simulations. The related statistical aspects are discussed. The analyses, being geometric in nature, apply to thin platelets as well. It should be noted, however, that the effects of thin platelets on the overall elastic properties is finite only if they are perfectly rigid.

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Reference

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