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# An Exactly Solvable Microgeometry in Torsion

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Finding a geometric configuration that is amenable to an exact characterization of the torsional rigidity is a relatively new territory that has only recently begun to be explored. Here we present our latest finding of an exactly solvable microgeometry in torsion for a cylindrical shaft with arbitrary cross section. The idea is to introduce a successive construction of neutral multicoated inclusions under torsion. We show, for a given cross-sectional shape of the host shaft, how to design permissible multicoated inclusions, with phase shear rigidities and area fractions appropriately balanced, so that after its introduction into a homogeneous host shaft the warping field in the host shaft will not be disturbed. We prove, without solving any field equations, that the torsional rigidity of a given cross section filled with an assemblage of multicoated inclusion can be exactly determined in a simple, explicit form.

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