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# Everywhere discontinuous anisotropy of thin periodic composite plates

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## Abstract

We consider an elastic periodic composite plate in the full bending regime, i.e. when the displacement of the plate is of finite order. Both the thickness of the plate  $h$  and the period of the composite structure  $\varepsilon$  are small parameters. We start from the non-linear elasticity setting. Passing to the limit as  $h, \varepsilon \rightarrow 0$  we carry out simultaneous dimension reduction and homogenisation to obtain an effective limit elastic functional which describes the asymptotic properties of the composite plate. We show, in particular, that in the regime  $h \ll \varepsilon^2$  the limit elastic functional is discontinuously anisotropic in every direction of bending. This remarkable property (suggesting that the corresponding composite plate can be referred to as metamaterial) is due to the in-limit linearisation of the bending deformations and the multi scale interaction.

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