

## **Bilayer Plates: Model Reduction, Analysis and Computation**

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We present a model for thin materials composed of two layers which react differently to specific stimuli; this is the case of micro-valves and nano-tubes. The model is the limit of a 3D hyperelastic energy in the bending regime, and consists of a quadratic energy involving the second fundamental form and a spontaneous curvature tensor. It is also subject to the constraint that the first fundamental form is the identity, which implies that the surface parametrization is an isometry. We introduce a discrete gradient flow discretized in space via quadrilateral Kirchhoff elements and show several essential properties: constructive existence of discrete solutions, control of deviation from the isometry constraint, and convergence of discrete minimizers. We conclude with several insightful simulations which exhibit large bending deformations and convergence to shapes other than cylinders depending on the plate aspect ratio. This work is joint with S. Bartels and A. Bonito.