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Bending of bilayers with general initial shapes. (English) Zbl 1431.74083
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Summary: We present a simple discrete formula for the elastic energy of a bilayer. The formula is convenient for rapidly computing equilibrium configurations of actuated bilayers of general initial shapes. We use maps of principal curvatures and minimum-curvature direction fields to analyze configurations. We find good agreement between the computations and an approximate analytical solution for the case of a rectangular bilayer. For more general shapes (simple polyiamonds), we find a range of typical bending behaviors: overall bending directions along longest and shortest dimensions, inward bending at corners, curvature intensification near boundaries, and conical bending and partitioned bending zones in some cases.

MSC:

74K99 Thin bodies, structures

74E30 Composite and mixture properties

74G10 Analytic approximation of solutions (perturbation methods, asymptotic methods, series, etc.) of equilibrium problems in solid mechanics

Cited in 1 Document

Keywords:

self-assembly; elastic energy; curvature direction; approximate analytical solution; rectangular bilayer

Full Text: [DOI](#) [arXiv](#)

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