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Plasticity and fracture of curved colloidal crystal shells CARLOTTA NEGRI, ALESSANDRO SELLERIO, IENI CNR, Institute for Energetics and Interphase, National Research Council, Via R. Cozzi 53, Milano 20125, Italy, M.-CARMEN MIGUEL, Departament de Física Fonamental, Facultat de Física, Universitat de Barcelona, Av. Diagonal 645, 08028 Barcelona, Spain, STEFANO ZAPPERI, IENI CNR, Institute for Energetics and Interphase, National Research Council, Via R. Cozzi 53, Milano 20125, Italy — Crystalline shells display peculiar equilibrium properties resulting from the interplay between geometrically necessary topological defects and curvature induced stresses. Here we report the results of large scale numerical simulations of the deformation of colloidal particles arranged in crystalline shells showing that the dynamics of topological defects exhibits a rich and non-trivial phenomenology. Depending on the mode of deformation, we observe intermittent plastic deformation with collective particle reorganization mediated by the proliferation of disclinations pairs and grain boundary reorientation or abrupt structural failure induced by crack nucleating at defects. Our work clarifies the role of topology and curvature in the mechanical deformation of crystalline shells.

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