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Topological quantum phases of helium-4 confined to nanoporous materials LODE POLLET, LMU Munich, Germany, ANATOLY KUKLOV, College of Staten Island, City University of New York, New York — The ground state of ^4He confined in a system with the topology of cylinder can display properties of solid, superfluid, and liquid crystal. This phase, which we call a compactified supersolid (CSS), originates from wrapping the basal planes of the bulk hcp solid into concentric cylindrical shells, with several central shells exhibiting superfluidity along the axial direction. Its main feature is the presence of a topological defect which can be viewed as a disclination with Frank index $n = 1$ observed in liquid crystals, and which, in addition, has a superfluid core. The CSS as well as its transition to an insulating compactified solid with a very wide hysteresis loop are found by ab initio Monte Carlo simulations. A simple analytical model captures qualitatively correctly the main property of the CSS—a gradual decrease of the superfluid response with increasing pressure.

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