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Quantum and thermal fluctuation effects on solid-light systems MARTIN HOHENADLER, University of Cambridge, MARKUS AICHHORN, University of Wuerzburg, CHARLES TAHAN, PETER LITTLEWOOD, University of Cambridge — Several theoretical proposals of strongly correlated polariton systems which exhibit a quantum phase transition from a Mott insulator to a superfluid phase have recently been made. Here we study Mott phases of polaritons in a model of optical microcavities in a photonic crystal with nearest-neighbor photon hopping. The variational cluster approach takes into account quantum fluctuations exactly on the lengthscale of finite clusters, and yields phase diagrams and single-particle spectra at zero and finite temperature in one and two dimensions. The relation of the model to the well-known Bose-Hubbard model is explored, and implications of our findings concerning the stability of the Mott state at finite temperatures for technological applications are discussed.

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