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Dynamical Cluster Approximation: Cluster Extension of CPA for Disordered System¹ CHINEDU EKUMA, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803, USA, WEI KU, TOM BERLIJN, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, Upton, New York, 11973, USA, JUANA MORENO, MARK JARRELL, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803, USA — The dynamical mean-field approximation (DMFA) or the coherent potential approximation (CPA) provides a convenient and effective method for studying disordered systems; however, non-local short range correlations of the disorder potential are neglected leading to a self-consistent single-site approximation. We combine the recently developed first principles method of Wei Ku and co-workers for the simulation of disordered systems with the dynamical cluster approximation (DCA) to develop a highly efficient means to treat disordered systems. We solve this model system using the DCA, which systematically incorporates short-range nonlocal correlations to the CPA. We apply this method to a number of model systems to illustrate where the DCA or a finite size simulation is more appropriate.

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