Anderson Localization: Dynamical Cluster Approximation - Typical Medium Theory Perspective[1] CHINEDU EKUMA, ZIYANG MENG, Center for Computation & Technology and Department of Physics and Astronomy, Louisiana State University, HANNA TERLETSKA, Department of Physics and Astronomy, Louisiana State University, JUANA MORENO, MARK JARRELL, Center for Computation & Technology and Department of Physics and Astronomy, Louisiana State University, VLADIMIR DOBROSAVLJEVIC, Department of Physics, Florida State University — Mean field theories like the coherent potential approximation (CPA) and its cluster extensions, including the dynamical cluster approximation (DCA), fail to describe the Anderson localization transition in disordered systems. This failure is intrinsic to these theories as the algebraically averaged quantities used in them always favor the metallic state, and hence cannot describe the localization transition. Here we extend the Typical Medium Theory (TMT), which replaces the average quantities with their corresponding typical (geometrically averaged) equivalents, to its cluster form such that non-local correlations can be incorporated systematically. We apply our method to study the localization phenomena in various dimensions. Such an approach opens a new avenue to study localization effect both in model and in real materials.

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