Phase Transition and Spatial Correlation of Localized States in the Falicov?Ramírez?Kimball Model

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The Falicov?Ramirez?Kimball model is solved by means of the two?atom cluster Caron?Pratt approximation. Metallic and insulating phases according to the value of an order parameter ? are obtained, and both second? and first?order phase transitions between them. Two kinds of insulating solutions (ordinary and mixed valence) and a variety of metallic states with different inter?ionic degrees of correlation are obtained. These results are found to be inqualitative accord both with experiments and former theoretical treatments.