Conduction Electron States and Ferromagnetism of Electron-doped EuO

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To study the conduction electron states and ferromagnetism of electron-doped EuO theoretically, we have applied two approximations to the s-f model and compared their results: virtual crystal approximation (VCA) and dynamical coherent potential approximation (dynamical CPA). The results of both approximations explain the anomalous magnetization curve experimentally observed in Gd-doped EuO and/or Eu-rich EuO with a low electron density, while only the result of dynamical CPA can explain the electron-density dependence of the Curie temperature T_C. The T_C calculated by VCA shows the monotonous increase with electron density, while the T_C calculated by dynamical CPA shows a maximum for a certain electron density. The mechanism of T_C increase is also discussed.