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The electrical and magnetic properties of C-doped ZnO film

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— The theoretical explanation on the room temperature ferromagnetism (RTF) in ZnO:C is based on the C incorporation at the O-site and the consequent exchange interaction between the localized C2p spins and valence-band holes. Here, we investigated the C incorporation site and the electrical properties of C-doped ZnO films grown by pulsed laser deposition (PLD) at both an oxygen rich and a poor conditions. Contrary to the theoretical explanations, all the C-doped ZnO films exhibited n-type conductivity. Furthermore, most of the carbons were not incorporated at the O-site, but rather at the interstitial or Zn site, or formed C clusters. Our experimental results indicate that the defect-induced ferromagnetism mechanism can better explain most of the observed RTF in the PLD grown ZnO:C films.

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