

# Influence of 3d-Metal Doping on Magnetotransport Properties of Magnetite Thin Films

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**In this paper, variation in magnetoresistance (MR) by transition-metal (TM) doping in magnetite ( $\text{Fe}_3\text{O}_4$ ) has been investigated. The samples ( $\text{T}_x\text{Fe}_{3-x}\text{O}_4$ ,  $\text{T} = \text{V}$ , and  $\text{Cr}$ ) were polycrystalline and prepared as thin films by a sol-gel method. As the TM composition ( $x$ ) increases, the MR strength is reduced but the reduction rate with  $x$  differs significantly for the two TM-doping cases. For the V-substituted samples, the MR is reduced rapidly with  $x$  and no significant MR is detected above  $x = 0.11$ . On the other hand, the Cr-substituted samples exhibit the MR effect up to  $x = 0.49$ . Such difference in MR strength between the two TM-doping cases is attributable to the difference in the intrinsic properties of the ternary ferrites such as electronic structure and carrier spin polarization.**

***Index Terms*—Electronic structure, magnetite, magnetoresistance (MR), spin polarization.**