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Exploring the relationship between thickness and the characteristic temperature of $\text{Mn}_{1.56}\text{Co}_{0.96}\text{Ni}_{0.48}\text{O}_{4\pm\delta}$ films

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$\text{Mn}_{1.56}\text{Co}_{0.96}\text{Ni}_{0.48}\text{O}_{4\pm\delta}$ (MCN) thin films, a very special negative temperature coefficient (NTC) oxide material, have a best application prospects in detector and sensor fields. It exhibits the high temperature coefficient of resistance (TCR), the excellent aging resistance performance, the wide operating temperature range, the broad band optical response and the long stability in operation. The functional relationship correlating thickness (d) and characteristic temperature (T_0) of the MCN films is formulated in this article. A series of MCN thin films with different thicknesses (d) are fabricated by Pulsed Laser Deposition process. The characteristic temperature (T_0) values are 3675, 3352, 3087, 3366 and 3816 K for MCN films with thickness from 265 to 887 nm. We formulate the functional relationship correlating d and T_0 of the MCN films by Lorenz analysis. It further demonstrates that a directly proportional relationship between the $1/T_0$ and d can be certain. The present results will open a way to design a desired negative temperature coefficient thermistor by adjusting the thickness of films.

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