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Application of colossal magnetoresistance Mn oxide thin films deposited by RF magnetron sputtering for infrared sensors

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Uncooled infrared(IR) microbolometers have got considerable attention both for space and terrestrial applications: for surveillance and reconnaissance, temperature monitoring, the automotive thermal imaging, security, fire detection, search and rescue, military, and medical purposes. Microbolometer is a resistive sensor that detects temperature changes through resistance change. To improve detecting ability, bolometer should be has a good resistive films which has a high TCR(temperature coefficient of resistance) value. Application of new thermistors with high temperature coefficient of resistivity and Si micromachining technique to fabricate thermally isolated microbridges enable revolutionary progress in thermal imaging. Generally, vanadium oxides, polycrystalline SiGe, Ti and Pt metal films on Si are used as thermistors whereas Si_3N_4 and SiO_2 films serve as the membranes.

Colossal magnetoresistance (CMR) of perovskite Mn oxides ($L_{1-x}A_xMnO_3$ where L and A are trivalent rare-earth ions and divalent alkaline earth ions, respectively) are received technological importance because its high TCR value which was discovered in the vicinity of metal to semiconductor phase transition temperature. In this work, colossal magnetoresistance Mn oxide thin films were obtained by RF magnetron sputtering. The films were deposited on amorphous SiO_2/Si and Si substrates. The structural and TCR properties of their films were investigated. And also the influence of post annealing conditions, substrate temperatures, and gas partial pressures have been investigated for application of CMR thin films for infrared sensors.