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Evidence of the oxygen vacancies-induced room temperature ferromagnetism in multiferroic Co-doped $LiNbO_3$ films

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ABSTRACT

Local Co structures and magnetic properties of the Co-doped $LiNbO_3$ films deposited by RF-magnetron sputtering have been systemically studied by different experimental techniques. The detailed structural analysis using XRD, XPS, XANES and EXAFS as well as full multiple-scattering *ab initio* theoretical calculations of Co K-edge XANES spectra show that the doped Co ions substitute for the Li sites of the $LiNbO_3$ lattice with +2 oxidation state and form $Co_{Li}+V_O$ complexs with oxygen vacancies in the nearest coordination shell of Co. No extra impurity peaks, such as Co metal clusters and Co oxide secondary phases were observed with the XRD detection limit. All the Co-doped $LiNbO_3$ films display obvious room temperature (RT) ferromagnetism with a Curie temperature of about 630K. The saturation magnetic

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