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Parameters controlling magnetic transitions in manganites B. DABROWSKI, S. KOLESNIK, O. CHMAISSEM, J. MAIS, Department of Physics, Northern Illinois University, DeKalb, IL 60115, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439 — Using description of structural and physical properties of perovskites in terms of the tolerance factor t(x,T,d), which is dependent on composition, temperature, and oxygen-content, we have established synthetic methods and studied composition-structure-properties for new manganites $La_{1-x-y}Sr_xBa_yMnO_{3-d}$ far beyond solubility limits normally achieved during the synthesis in air. Parameters controlling magnetic transitions have been identified through examples of single-valent compounds of $RMnO_3$ (the Mn-O-Mn bond angles that can be equivalently described in terms of the tolerance factor) and $Sr_{1-x}Ca_xMnO_3$ (the tolerance factor and the variance of A-site ion sizes), and the mixed-valent $La_{0.5}Sr_{0.5-y}Ba_yMnO_3$ (the tolerance factor, variance of sizes, and the local strains described in terms of the elongated Mn-O bonds). By using an example of kinetically stable, atomically-ordered layered-perovskites $RBaMn_2O_6$ we show that the increase of Curie temperature T_c and enhancement of colossal magnetoresistive effect at room temperature, can be achieved through reduction of variance of sizes and local strains. Work at NIU was supported by the NSF-DMR-0302617 and at ANL by the U.S. DOE under contract No. DE-AC02-06CH11357.

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