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From ferrimagnetic to spin glass behavior and back in lamellar Mn oxides undoped and doped with Co

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In this work we describe magnetization measurements on lamellar Mn oxides un-doped and doped with Co. They show that the magnetic structure of this oxides system is extremely sensitive to the (Co/Mn) ratio. Special emphasis is given to the inverse susceptibility and the temperature derivative of the magnetic susceptibility. Interestingly, the magnetic order changes from a typical ferrimagnetic one with two sublattices (sample with Co/Mn = 0) to an unconventional ferrimagnetic one with many sublattices (sample with Co/Mn = 0.014) and, subsequently, to a possible spin glass-type structure (sample with Co/Mn = 0.037), before finally back to a predominant typical ferrimagnetic order taking place at intermediate temperatures (sample with Co/Mn = 0.096) with increasing the (Co/Mn) ratio. The behavior of the susceptibility is described by means of its association with the spatial range of correlations between the spins of the system. The possible mechanisms leading to such unusual changes of magnetic ordering are discussed, including the super exchange interaction, double exchange interaction, and the frustration associated to such magnetic interactions.

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