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Low Temperature Interactions of High SpinMagnetic Excitons in $LaCoO_3$ SEAN GIBLIN, Rutherford Appleton Lab, ISIS, IAN TERRY, University of Durham, UK, ANDREW BOOTHROYD, University of Oxford, UK, CHRIS LEIGHTON, University of Minnesota — The low temperature magnetic behavior of $LaCoO_3$, containing oxygen vacancies, is reported. Magnetic susceptibility measurements made in the temperature range 0.5 K to 35 K on a single crystal and a polycrystalline sample provide strong evidence for the existence of magnetic excitons as fundamental entities within in the bulk of the material system. Specifically, two distinct types of excitons form, isolated and interacting excitons, both of which are associated with oxygen vacancies. Isolated magnetic excitons act as high spin paramagnetic particles, whilst the interacting excitons appear to be coupled antiferromagnetically. It is proposed that the interaction arises from the overlap of magnetic excitons as a consequence of the statistical clustering of oxygen vacancies. The striking similarity of these results with those of the lightly doped $La_{0.97}Sr_{0.03}CoO_3$ suggests that the observed excitons are a precursor to magneto-electronic phase separation and supports the idea that phase separation is initiated by disorder in the material system.

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