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Untangling the cerium and iron contributions to the magnetism of Ce-doped yttrium iron garnet G. HERRANZ, B. CASALS, R. CICHELERO, J. FONTCUBERTA, Institute for Materials Science of Barcelona ICMAB-CSIC, H.B. VASILI, P. GARGIANI, M. VALVIDARES, J. HERRERO-MARTIN, E. PELLEGRIN, ALBA Synchrotron Light Source, Spain, J. GESHEV, Univ Fed Rio Grande do Sul, Brazil — Due to their large magneto-optic responses, rare-earth-doped yttrium iron garnets, $Y_3Fe_5O_{12}$ (YIG), are highly regarded for their potential in photonics and magnonics. Here we consider the case of Ce-doped YIG (Ce-YIG), in which substitutional Ce^{3+} ions are magnetic because of their $4f^1$ ground state. Hence, it is expected that Ce substitution can remarkably impact on the magnetization of YIG. However, it is not completely understood how exactly the Ce ions contribute to the macroscopic magnetic properties. Having this in mind, we have carried out magneto-optical and soft x-ray spectroscopy measurements on Ce-YIG thin films. In particular, we have used the element-specificity of XMCD to extract the individual magnetic hysteresis loops linked to Ce^{3+} and Fe^{3+} ions, respectively. Our results show that the doping of YIG with Ce causes a disruption of the electronic and magnetic properties of the parent compound, which results into a reduction of the magnetic coupling between the Ce and Fe magnetic moments, especially at low magnetic fields. Our results are relevant for the understanding of magnetism in rare-earth doped YIG and, eventually, may enable a quantitative evaluation of the magneto-optic properties of rare earth incorporation into YIG.

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