

# Structural and magnetic characterization of $\text{Gd}_2\text{Ru}_2\text{O}_7$ and $\text{Gd}_{2-x}\text{Y}_x\text{Ru}_2\text{O}_7$ with $x = 0.1, 0.2, 0.5$ and $2$

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Pyrochlore are oxides with the general formula  $\text{A}_2\text{B}_2\text{O}_7$ . In these compounds the A site can be occupied by elements with valences +1, +2, +3 or +4 valence, and the site B, for the charge neutrality, may be occupied by elements with +3, +4, +5 or +6 oxidation state [1]. In recent years, more attention has been given to these materials by presenting magnetic frustration of geometric origin, like observed in  $\text{Gd}_2\text{Ti}_2\text{O}_7$  and  $\text{Gd}_2\text{Sn}_2\text{O}_7$  pyrochlores [2]. In this work we study the structural and magnetic properties of  $\text{Gd}_{2-x}\text{Y}_x\text{Ru}_2\text{O}_7$ ,  $x = 0.0, 0.1, 0.2, 0.5$  and  $2$ , pyrochlores. The compounds were synthesized by the modified solid state reaction method, where nitric acid was added to homogenize the solid solution. Stoichiometric quantities of the precursor oxides were mixed, grounded, pressed into pellet and subsequently fired, in air, to  $400^\circ\text{C}$  for 3 hours, and then furnace cooled to room temperature. The samples were then regrounded, pelletized and fired again to  $850^\circ\text{C}$  for 24 hours. This procedure was repeated once again, but now at  $1100^\circ\text{C}$  for 24 hours. Structural characterization was done by X-ray diffractometry (XRD) with Rietveld refinement and dc magnetization measurements. The XRD results show that the samples crystallized in a face centered cubic structure without any other phase present. Magnetic measurements show a clear decrease of the magnetization of the pristine sample pyrochlore  $\text{Gd}_2\text{Ru}_2\text{O}_7$  with the introduction of the Y at the site of gadolinium. All sample studied presented a paramagnetic behavior at high temperatures with a deviation from the Curie-Weiss law at low temperatures, indicating an antiferromagnetic ordering. The magnetization curves show irreversibility behavior at low temperature. It was observed two magnetic transitions [3] around 15.5 K and 9.5 K.

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[1] C. Mari, F. Bonino, M. Catti, R. Pasinetti, and S. Pizzini, *Solid State Ionics* **18**, 1013 (1986).

[2] P. Bonville et al., *J. Phys.: Condens. Matter* **15**, 7777 (2003).

[3] R. P. Bontchev, A. J. Jacobson, M. M. Gospodinov, V. skumryev, V. N. Popov, B. Lorenz, R. L. Meng, A. P. Litvinchuk and M. N. Iliev. *Phys. Rev. B*, 62:12235 (2000).

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