

## ***R*-site randomness effect on spin/orbital order in perovskite $RVO_3$**

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Perovskite  $RVO_3$  ( $R$ : rare earth elements or Y) has orbital degrees of freedom between  $d_{yz}$  and  $d_{zx}$  orbitals in  $V^{3+}$  ions, and shows two types of spin/orbital order:  $G$ -type orbital order ( $G$ -OO) accompanied with  $C$ -type spin order ( $C$ -SO), and  $C$ -OO with  $G$ -SO. In this system, the transition temperature of each spin/orbital order depends on the  $R$ -site ionic radius<sup>1</sup> and structural randomness caused by the size mismatch of the cations at the  $R$ -site<sup>2</sup>.

We have investigated the  $R$ -site randomness effect on spin/orbital order in  $RVO_3$  with several  $R$ -site ionic radius. In  $YVO_3$  and  $EuVO_3$  with the small  $R$ -site ionic radius and located near the phase boundary<sup>1</sup>, the randomness suppresses  $C$ -SO/ $G$ -OO, while it stabilizes the other SO/OO. By the neutron and resonant X-ray scattering measurements, the other order was confirmed as  $G$ -SO/ $C$ -OO. In  $NdVO_3$  with large  $R$ -site ions, however,  $C$ -SO/ $G$ -OO is so stable that the randomness cannot induce the other SO/OO.

<sup>1</sup>S. Miyasaka *et al.*, Phys. Rev. B, **68**, 100406(R) (2003).

<sup>2</sup>J. -Q. Yan *et al.*, Phys. Rev. Lett, **99**, 197201 (2007).