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Anomalous weak ferromagnetism in $R_{1-x}\mathbf{Y}_x\mathbf{B}_4$ (R = Sm, Gd, Tb, Dy, Ho, Er) B.Y. KANG, MYUNGSUK SONG, B.K. CHO, School of Materials Science and Engineering, Gwangju Institute of Science and Technology (GIST), Korea, J.Y. KIM, Research Institute of Industrial Science & Technology, Korea — Since the report of magnetic properties of rare earth tetraborides, $R\mathrm{B}_4$ (R =rare-earth elements), $R\mathrm{B}_4$ compounds have received a great attention over last decades because it shows various interesting magnetic ground states depending on rare-earth elements. $R\mathrm{B}_4$ exhibits antiferromagnetic ordering at low temperature and is classified as the Shastry-Sutherland lattice, which is a geometrically frustrated system. In this system, the disturbance of a delicate balance can lead to new electronic and magnetic states. In this study, single crystals of $R_{1-x}\mathrm{Y}_x\mathrm{B}_4$ (R =Sm, Gd, Tb, Dy, Ho, Er), (x=0, 0.1, 0.2, 0.3, 0.35, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1) were synthesized using the high-temperature Al solution growth method. Interestingly, weak ferromagnetism was found to emerge at the Néel temperature for the Y-doped single crystals of $R_{1-x}\mathrm{Y}_x\mathrm{B}_4$. The magnitude of spontaneous magnetic moment was found to be correlated with the Y substitution ratio, which have maximum value at about 30% of Y-concentration. The weak ferromagnetism reveals also a strong magnetic anisotropy depending on rare-earth elements. The observed data indicate that the weak ferromagnetism is not due to an individual atomic effect but a systematic bulk effect. The exotic antiferromagnetic properties will be discussed in detail in terms of yttrium substitution and magnetic and geometrical structures.

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