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Spatial confinement effect on $TbMn_2O_5$ nanorods CHUN CHUEN YANG, JING HUEI WANG, WEI LUEN HUANG, CHANG YU WENG, Department of Physics, Chung Yuan Christian University, CIH LIAN HONG, YANG YUAN CHEN, Institute of Physics, Academia Sinica, DEPARTMENT OF PHYSICS, CHUNG YUAN CHRISTIAN UNIVERSITY COLLABORATION, INSTITUTE OF PHYSICS, ACADEMIA SINICA COLLABORATION — Series of $TbMn_2O_5$ nanorods were fabricated by hydrothermal method with different annealing temperatures. Three samples which width by length equal to 10(4) nm × 38(14) nm, 25(6) nm × 64(18) nm, and 101(25) nm × 216(54) nm are identified by TEM images, x-ray diffraction, and SAED schemes. Furthermore discovery show that the preferred growth direction is along c axis (length). Ac magnetic susceptibility and specific heat measurements revealed incommensurate (∼41 K) and commensurate (∼38 K) Mn antiferromagnetic ordering peaks are only appeared in 101(25) nm × 216(54) nm sample. In this case, the small size effect resulted entropy difference of Mn magnetic ordering is 27 % less than bulk one. At 5 K, a small hysteresis loop was also observed in the identical sample and indicated the FM domains occurred. No such magnetic and thermal behaviors were found in another two samples. We believe this is attributing to spatial limitation and distortion caused by low surface-volume ratio. The estimated magnetic correlation length of Mn is in between 25 and 64 nm.

Chun Chuen Yang
Department of Physics, Chung Yuan Christian University

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