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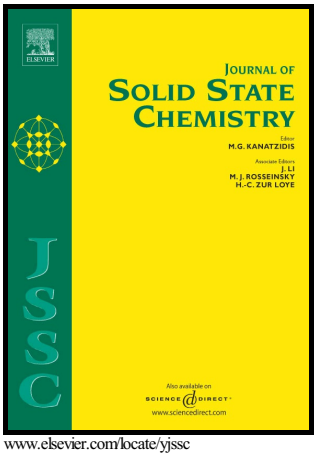

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Autoclave Growth, Magnetic, and Optical Properties of GdB_6 Nanowires

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Abstract

High-quality single crystalline gadolinium hexaboride (GdB_6) nanowires have been successfully prepared at very low temperatures of 200-240 °C by a high pressure solid state (HPSS) method in a autoclave with a new chemical reaction routes, where Gd, H_3BO_3, Mg and I_2 were used as raw materials. The crystal structure, morphology, valence, magnetic and optical absorption properties were investigated using XRD, FESEM, HRTEM, XPS, SQUID magnetometry and optical measurements. HRTEM images and SAED patterns reveal that the GdB_6 nanowires are single crystalline with a preferred growth direction along [001]. The XPS spectrum suggests that the valence of Gd ion in GdB_6 is trivalent. The effective magnetic momentum per Gd^{3+} in GdB_6 is about 6.26 μ_B. The optical properties exhibit weak absorption in the visible light range, but relatively strong absorbance in the NIR and UV range. Low work function and high NIR absorption can make GdB_6 nanowires a potential solar radiation shielding material for solar cells or other NIR blocking applications.

Key words: Gadolinium hexaboride (GdB_6); Nanowire; Optical absorption; High pressure solid state; Magnetic