

Preparation of magnesium diniobate by solid–state reactions and its role for hydrogen storage

Md. Wasikur Rahman^{1, 2}

¹ Department of Chemical Engineering, Jessore University of Science and Technology, Jessore, Bangladesh

² Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Kuantan, Malaysia

ABSTRACT

A ternary compound of magnesium diniobate (MgNb_2O_6) was prepared by solid–state reactions in order to understand the role of transition metal oxides as a promoter/catalyst for hydrogen storage in Mg/MgH_2 systems. MgNb_2O_6 was prepared in almost pure form in oxidizing conditions by annealing a stoichiometric mixture of MgO and Nb_2O_5 . The effect of calcination temperatures on phase formation, reaction kinetics, and heat of reaction of the solid–state product was investigated by ex situ, in situ X-ray diffraction (XRD), and differential scanning calorimetry (DSC). Hydrogen sorption properties of the compound were investigated by mass spectrometer. The crystallographic parameters of binary and ternary Mg-Nb-O phases were extracted by Rietveld method. During solid–state synthesis, the formation of MgNb_2O_6 provides single-step reaction between precursor materials proved by in situ experiment and the heat of formation as well as driving force was calculated from calorimetric analysis.

KEYWORDS

Solid–state synthesis; Magnesium diniobate; X-ray techniques; Reaction kinetics; Rietveld refinement

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