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MS-5-P-6058 Characterization of niobium carbides obtained via temperature programmed synthesis assisted with metallic magnesium.

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Transition metal carbides are ceramic refractory with unique properties such as a high melting, extreme hardness, excellent electrical and thermal conductivity, and high resistance to oxidation and corrosion. Therefore, the carbides of transition metals have a broad application in the area of metallurgy. However, the chemical stability of these compounds and their similarity in the catalytic properties of the noble metals of group 8 to 10, make of the transition metal carbides of great interest in the area of catalyst for a variety of reactions including hydrotreatment reactions. These materials are generally obtained by the synthesis method programmed temperature (TPS) of the metal oxide using a gas mixture to high temperatures, greater than 1500ºC. In this work, niobium carbides were synthesized using an alternative methodology via a decomposition-reduction route by the reaction of metallic magnesium powder with niobium oxide at 650ºC. With this method can prepare niobium carbide powder at a lower temperature in comparison with conventional methods. Gas mixture used for reduction and carburetion of metal was hydrogen (H2) and liquefied petroleum gas (LPG) in 9:1 ratio. The products were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and specific surface area by Brunauer-Emmett-Teller (BET) methods. The solids obtained show a specific surface area of 4m2/g. Mixture of niobium carbide (NbC) and niobium oxide (Nb_2O_5) was observable by XRD patterns, because the niobium carbide was passive with a mixture of O_2 /N_2 at 1%. SEM images showed particles like corals and wide size range, due to sintering of the particles (Figure 1). The TEM image of the NbC is shown in Figure 2, which indicates the synthesized NbC consists of particles 0.2 µm in diameter. This alternative route to the synthesis method allows obtaining niobium carbides at lower temperatures.

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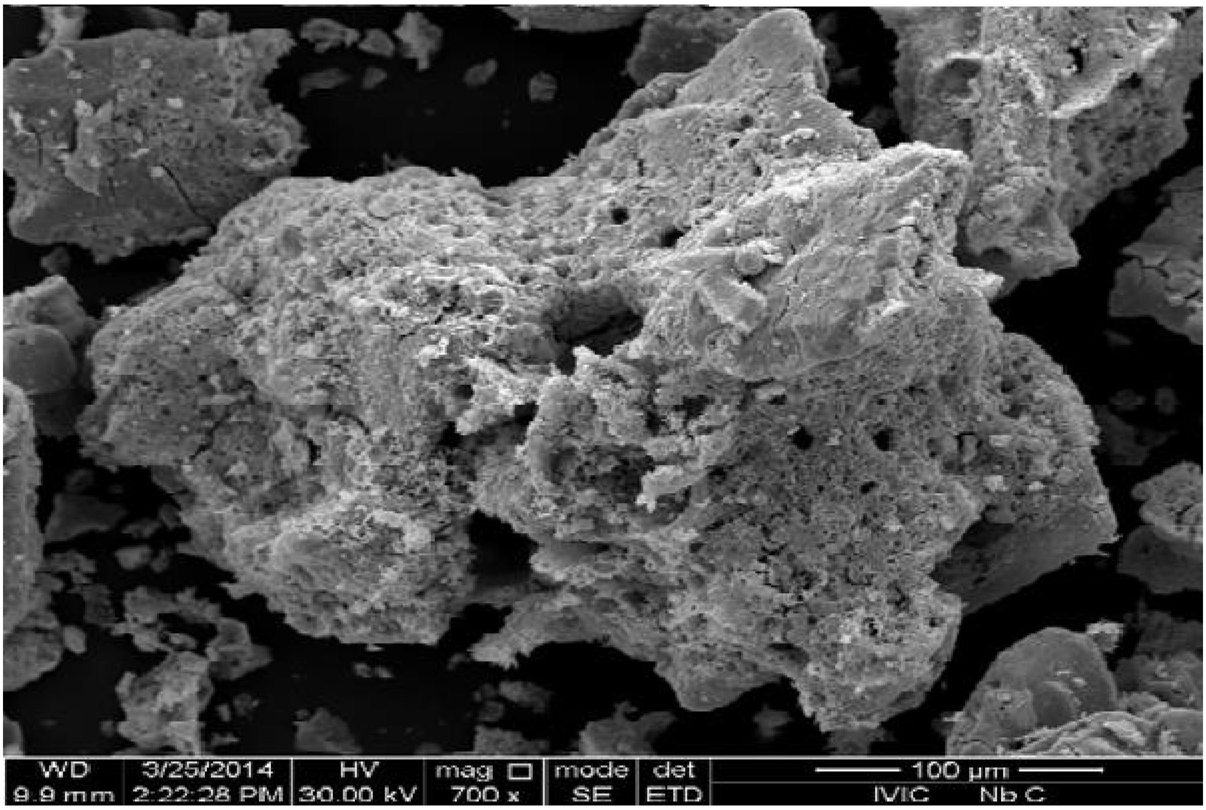

Fig. 1: SEM image niobium carbide

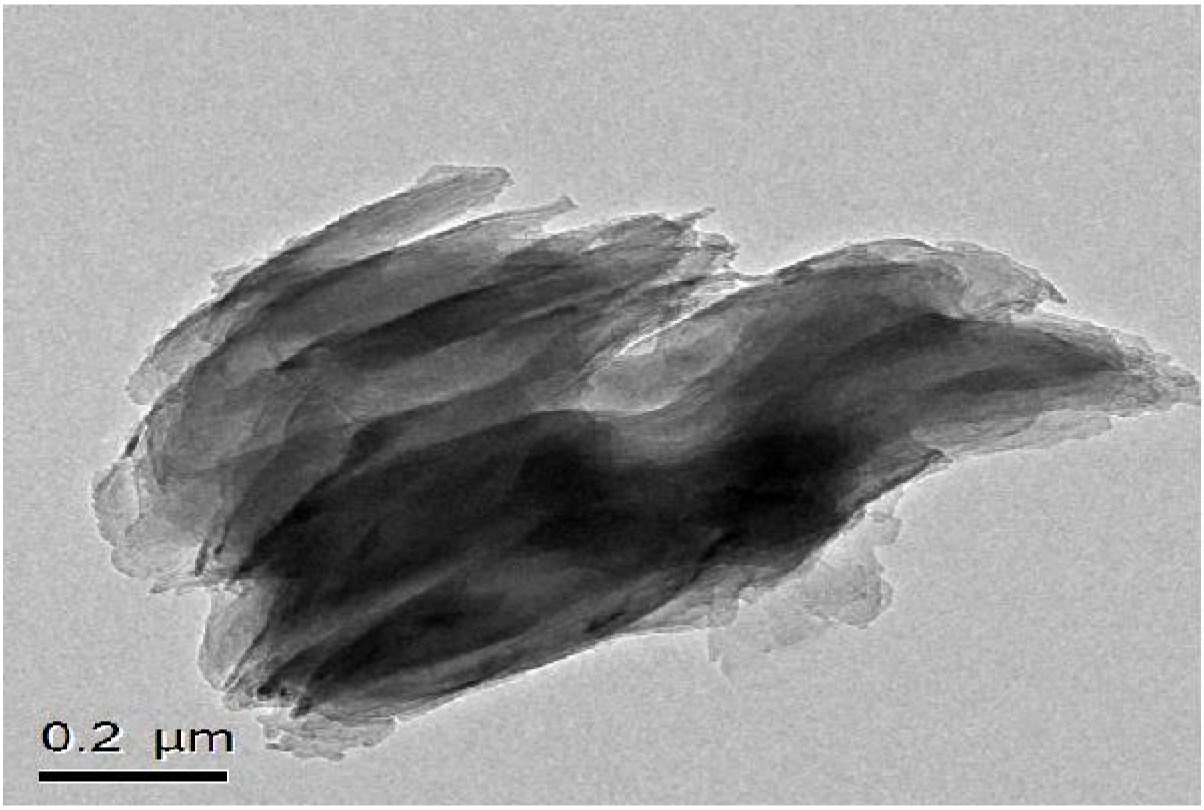

Fig. 2: TEM image niobium carbide