

Preliminary study on the ball milling of Al₂O₃-Nb₂O₅-Ta₂O₅ powder mixtures

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Abstract:

Bimetal oxides are potentially attractive for chemical looping combustion (CLC) and chemical looping reforming (CLR) processes. This study reports on the processing of Al₂O₃-Nb₂O₅-Ta₂O₅ powder mixtures by ball milling varying their molar ratio: 50/45/5, 50/5/45, 50/50/0, and 95/5/0. The milling process was carried out in a Fritsch P-7 planetary ball mill using zirconium oxide balls (10 mm diameter) and vial (80 mL), 600 rpm, and a ball-to-powder weight ratio of 10:1. The characterization of milled Al₂O₃-Nb₂O₅-Ta₂O₅ powders was conducted by means of X-ray diffraction, BET analysis, He pycnometry, and scanning electron microscopy techniques. Results indicated that metastable phases were formed during ball milling of Al₂O₃-Nb₂O₅-Ta₂O₅ powder mixtures, and no evidence of AlNbO₄ neither AlTaO₄ was found after milling for 300 min. Despite the low specific area for as-catalyst applications the pore amount was slightly increased during ball milling.