

## Abstract

Manganese oxide octahedral molecular sieves (OMS) are important materials in environmental chemistry, electrochemistry, and heterogeneous catalysis. Here, a rapid process to prepare cryptomelane-type octahedral molecular sieve (OMS-2) nanomaterials using a microwave assisted hydrothermal technique (MW-HT) is presented. With the assistance of microwaves in the hydrothermal reaction, the preparation time of OMS-2 can be as short as 10 s; up to 4 days are required in a conventional hydrothermal reaction. Direct observation of reaction temperature and pressure in the hydrothermal reaction can be achieved in real time in the reaction process. Reaction time and temperature are two parameters chosen to examine the formation conditions of OMS-2 materials. A reaction temperature below 80 °C resulted in the formation of amorphous manganese oxide material, whereas crystalline phase OMS-2 materials were formed at increased reaction temperatures to 100 °C or above. Studies by field emission scanning electron microscopy (FE-SEM) and transmission electron microscopy (TEM) showed that the OMS-2 nanowires were produced from thin nanoflakes with increasing reaction temperatures. The N<sub>2</sub> physisorption study showed that the material formed at 100 °C had the highest BET surface area and pore volume. This technique was also used to test the cinnamyl alcohol oxidation of as-prepared OMS-2 materials.