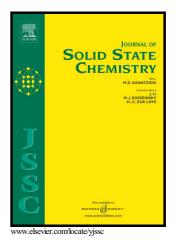
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## A facile pathway to prepare VO<sub>2</sub> and V<sub>2</sub>O<sub>3</sub> powders via a carbothermal reduction process

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## Abstract

The development of a highly efficient and low cost production process is instrumental for the wide application of VO<sub>2</sub> and V<sub>2</sub>O<sub>3</sub>. In this paper, VO<sub>2</sub> and V<sub>2</sub>O<sub>3</sub> powders are successfully prepared via carbothermal reduction of V<sub>2</sub>O<sub>5</sub> in a flowing Ar atmosphere at 973 K and 1423 K, respectively. Compared with the traditional methods, graphite is used as a reductant, which resulted in a low cost. The experimental results show that a high temperature assists in improving the kinetic rate. The phase transformation during the low-temperature reduction process between 948 K and 973 K occurs in the following sequential order :  $V_2O_5 \rightarrow V_6O_{13} \rightarrow VO_2$ . When the temperature is 1423 K or 1473 K, the phase transformation can be described as follows:  $V_2O_5 \rightarrow V_3O_5 \rightarrow V_2O_3$ . Owing to the shrink of the volume, the as-prepared VO<sub>2</sub> and V<sub>2</sub>O<sub>3</sub> particles could not maintain the original micro-morphology of V<sub>2</sub>O<sub>5</sub>. Relative to VO<sub>2</sub>, the as-prepared V<sub>2</sub>O<sub>3</sub> particles are porous. It is also concluded that the V<sub>2</sub>O<sub>3</sub> can be easily oxidized to VO<sub>2</sub>, when the partial pressure of O<sub>2</sub> is in the range of 10<sup>-8</sup> atm to 10<sup>-1</sup> atm. Therefore, a reasonable reaction temperature and reaction time are important to prepare high purity V<sub>2</sub>O<sub>3</sub>.

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