Effect of High-energy Milling on the Solid State Formation of Zinc Manganites ($Zn_xMn_{3-x}O_4$, $0.5 \leq x \leq 1.5$) from the System $ZnC_2O_4 \cdot 2H_2O$-n $MnCO_3$ (n = 1, 1.5 and 2)

Vittorio Berbenni, Chiara Milanese, Giovanna Bruni, and Amedeo Marini

CSGI – Unità Operativa di Pavia, Dipartimento di Chimica Fisica dell'Università di Pavia, Via Taramelli 16, 27100 Pavia, Italy

Reprint requests to Dr. Vittorio Berbenni. Fax: +39-0382-987575.
E-mail: berbenni@matsci.unipv.it

Z. Naturforsch. **2007**, *62b,* 663 – 668; received November 20, 2006

By combination of TG/DSC and XRPD measurements it has been shown that zinc manganites form ($Zn_xMn_{3-x}O_4$ with $0.5 \leq x \leq 1.5$) starting from mixtures of zinc oxalate dihydrate and manganese carbonate subjected to mechanical activation by high energy milling. Solid solutions ZnO-Mn_3O_4-$ZnMn_2O_4$ are the products obtained by the same experimental conditions, when starting from a physical mixture. Furthermore milling, besides changing the enthalpy of dehydration of zinc oxalate, induces a partial formation of amorphous Mn_3O_4 at r. t. In particular $ZnMn_2O_4$ can be prepared by annealing the milled mixture for 18 h at 650 °C while a temperature > 1000 °C is needed to prepare $ZnMn_2O_4$ from a physical mixture. Finally, the calorimetric data suggest that the mechanism of the reaction is different in the two kinds of mixtures.

Key words: Zink Manganites, $ZnMn_2O_4$, Mechanical Milling, Simultaneous TG/DSC