The Effect of High Energy Milling on the Solid State Synthesis of $MnFe_2O_4$ from Mixtures of $MnO-Fe_2O_3$ and $Mn_3O_4-Fe_2O_3$

V. Berbenni[a], A. Marini[a], A. Profumo[b], and L. Cucca[b]

[a] CSGI – CNR IENI – Dipartimento di Chimica Fisica dell'Università di Pavia Via Taramelli 16, 27100 Pavia, Italy

[b] Dipartimento di Chimica Generale dell'Università di Pavia Via Taramelli 12, 27100 Pavia, Italy

Reprint requests to Dr. V. Berbenni. Fax: 0039-0382-507575. E-mail: berbenni@matsci.unipv.it

Z. Naturforsch. **58b,** 415–422 (2003); received January 30, 2003

A thermal treatment at 900 °C (under nitrogen) of a milled mixture $MnO-Fe_2O_3$ yields $MnFe_2O_4$ mainly as the product of the reaction between Mn_3O_4 (produced by ball milling) and Fe_2O_3. Under the same experimental conditions but starting from an unmilled $MnO-Fe_2O_3$ mixture, the formation of $MnFe_2O_4$ is only partial and occurs through Mn_3O_4 (formed by oxidation of MnO). The same thermal treatment (900 °C under nitrogen) of a milled $Mn_3O_4-Fe_2O_3$ mixture yields $MnFe_2O_4$ mainly as the product of the reaction between Mn_3O_4 and Mn_2O_3/MnO_2 (the higher Mn oxides being produced by ball milling) and Fe_2O_3. The effect of high energy milling is more pronounced in the case of the $Mn_3O_4-Fe_2O_3$ system since no $MnFe_2O_4$ formation is observed when starting from a physical mixture.

Key words: Mechanical Activation, Manganese Ferrite, Thermogravimetric Analysis