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The effect of heat treatment on the lattice parameter of nickel ferrite.

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Abstract

Room-temperature X-ray precision measurements of the lattice parameters of spectroscopically pure polycrystalline nickel ferrite ($NiFe_2O_4$) samples, sintered in air in the range 1373–1773 K, show that the lattice parameter increases with increasing sintering temperatures; a result which is in conformity with the expected $Fe^{3+} \rightarrow Fe^{2+}$ transformation.

Introduction

The general strategy in X-ray precision measurements of the lattice parameters of polycrystalline substances (Parrish & Wilson, 1959; Lipson & Steeple, 1968; Subramanyam, 1971*a*,*b*; Subramanyam & Khare, 1978; and others) has been carefully followed for the purpose of assessing the sensitivity of the lattice parameter of polycrystalline $NiFe_2O_4$ to the final temperatures at which the specimens have been sintered. Starting with spectroscopically pure oxides of Ni and Fe (supplied by Johnson Matthey Chemicals Ltd, UK), the final samples of $NiFe_2O_4$ were obtained by sintering the compressed mixture of oxides in air at closely controlled temperatures (1373, 1473, 1573, 1673 and 1773 K) (see Fig. 1 and Table 1); subsequently, their X-ray photographs were taken with Co radiation ($K\alpha_1 = 1{\cdot}7889$, $K\alpha_2 = 1{\cdot}7928$ Å).

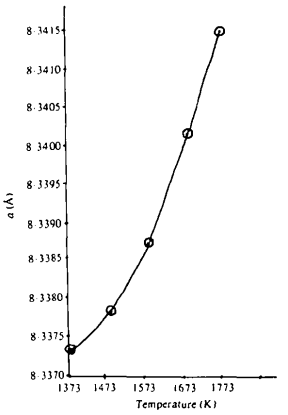

Fig. 1. Sintering temperature (K) *vs* lattice parameter *a* (Å) for $NiFe_2O_4$ samples sintered in air.

Table 1. *Sintering temperature versus the lattice parameter for* $NiFe_2O_4$ *sintered in air*

The reflections used throughout were 555 (α_1 and α_2), 662 (α_2), 840 (α_1 and α_2) and 911 (α_1).

Sintering temperature	Lattice parameter (*a*)
1373 K	$8{\cdot}3373 \pm 2 \times 10^{-4}$ Å
1473	$8{\cdot}3378 \pm 3 \times 10^{-4}$
1573	$8{\cdot}3387 \pm 3 \times 10^{-4}$
1673	$8{\cdot}3401 \pm 3 \times 10^{-4}$
1773	$8{\cdot}3414 \pm 3 \times 10^{-4}$

Discussion

The loss of oxygen (δ) that takes place during the sintering of $NiFe_2O_4$, which is given by $Ni_1^{2+}Fe_2^{3+}O_4^{2-} \rightarrow Ni_1^{2+}Fe_{2\delta}^{2+}Fe_{2-2\delta}^{3+}O_{4-\delta}^{2-} + O_\delta^{2-}$, shows that as the rate of evaporation of oxygen from the structure increases with increasing temperature, so does the ferrous-ion concentration. Indeed, the results presented here are in conformity with the fact that Fe^{2+} ions have a much larger radius than Fe^{3+} ions (Standley, 1962).

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The crystal structure of tetracycline hexahydrate: erratum.

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Abstract

The paper by Caira, Nassimbeni & Russell [*Acta Cryst.* (1977), B**33**, 1171–1176] contains a typographical error. In Table 3 the *z* coordinate of C(12) should be 0·6088 instead of 0·4088.

All the relevant information is contained in the Abstract.