

New Route of Preparation and Properties of NaNiO_2

Mikhail Sofin and Martin Jansen

Max-Planck-Institut für Festkörperforschung,
Heisenbergstraße 1, D-70569 Stuttgart, Germany

Reprint requests to M. Jansen.
E-mail: m.jansen@fkf.mpg.de

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NaNiO_2 was prepared through oxidation of a $\text{Na}_2\text{NiO}_2/\text{NiO}$ mixture (1:1) in dried oxygen at 500 °C. Single crystals have been grown by annealing of NaNiO_2 powder at 600 °C for 83 d in a flow of dried oxygen. According to the X-ray analysis of the crystal structure ($C2/m$, $Z = 2$, $a = 5.3177(2)$, $b = 2.8458(1)$, $c = 5.5819(3)$ Å, $\beta = 110.409(2)^\circ$, $R_1(\text{all}) = 3.4\%$, 185 independent reflections), the Jahn-Teller distorted NiO_6 octahedra, sharing edges, build up layers lying parallel to the ab plane. A phase transition (associated with an energy of 2.9 kJ/mole) to a high temperature rhombohedral form ($R\bar{3}m$, $Z = 3$, $a = 2.958(1)$, $c = 15.748(2)$ Å, at 300 °C) was observed by Guinier and DSC measurements at 195 °C. The magnetic susceptibility of the monoclinic phase can be described by the Curie-Weiss law between 100 and 330 K: $\mu = 2.01\mu_B$ ($g = 2.32$), $\Theta = 37$ K, indicating the dominance of ferromagnetic interactions of $S = 1/2$ spins within the NiO_2 layers. Antiferromagnetic interlayer interactions produce an overall antiferromagnetically ordered structure below 18 K.

Key words: Sodium Nickel Oxide, Crystal Structure, Magnetic Properties, Azide/Nitrate Route, DSC