

## Pressure dependence of electrical resistivity of cummingtonite from the world's deepest Kola super deep-borehole (KSDB-3), Russia

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We present here for first time the temperature and pressure dependence of the electrical resistivity of cummingtonite from the Kola super-deep borehole (KSDB-3) up to 700 K and 4 GPa. The Kola super-deep borehole near Zapolyarny, Kola Peninsula, Russia is the deepest borehole in the world (12261 m deep) that has penetrated Proterozoic complex from the surface to 6840 meters, with mafic meta-volcanic on the top 1000m, metasedimentary rocks from 2800m to 4500 m, and intermediate metavolcanics dominating from down to 6800 m depth, further in the depth region 6800 m to 12261 meters the KSDB-3 intersects an Archaean gneiss-migmatite complex with ubiquitous amphibolites bodies up to 30 meters thickness. About 1/3 of the total cross section of the borehole consists of amphibolites [1]. High-pressure electrical resistivity measurements were carried out in a Bridgman opposed anvil system, up to 9 GPa [2]. We have observed a distinct slope change in the Arrhenius plot of the electrical conductivity of cummingtonite at 455 K, which can be explained as a  $Mg^{2+} \rightarrow Fe^{2+}$  cation order-disorder phase transition, which is due to the migration of  $Fe^{2+}$  from M4 to M1, M2, M3 sites at 683 K [3]. The conductivity activation energy has been measured at different pressures, and found to be decreasing from 065 eV at room pressure to 0.35 eV at 6GPa.

[1] Mitrofanov FP & Gorbatshevich FF (2000) *IGCP project 408*, Apatity, Russian Academy of Sciences. 153pp.

[2] Parthasarathy, G (2006) *J. Applied Geophys.* **58**, 321.

[3] Ghose, S & Weidner JR (1972) *Earth. Planet. Sci. Lett* **16**, 346.

## Spectroscopic investigations on natural stichtite and synthetic hydrotalcites

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We present here structural and thermal properties of synthetic hydrotalcites and natural stichtite. Stichtite, a rare hydrated carbonate-hydroxide of Mg and Cr with ideal formula  $Mg_6Cr_2(OH)_{16}CO_3 \cdot 4H_2O$ , occurs in chromite bearing serpentinites of Nuggihalli Archaean greenstone belt, India.[1]. The efficiency of  $CO_2$  adsorption based separation is based on the structural and thermal characteristics of the adsorbent. There are several naturally occurring minerals like zeolites, in the Deccan Trap area with high  $CO_2$  adsorption capacity. However, most of these adsorbents suffer from low capacity at high temperature (seen in the combustion processes). Hydrotalcite is one of the few minerals with significant anion exchange capacity, and stands in contrasts to the more common mesoporous clay minerals, which have cation exchange properties. Carbon-dioxide adsorbing capacity has been investigated by using hydrotalcites as high temperature adsorbents. We present here the compositional and structural characteristics of the naturally occurring stichtite and synthetic hydrotalcites by using spectroscopic methods, and the potential applications of synthetic hydrotalcites and naturally occurring stichtite in the study of the adsorption of carbon dioxide are discussed. Infrared spectroscopic studies on the stichtite shown several absorption bands at 1460, 1380, 745 and 685  $cm^{-1}$ , all of them are assigned as per the standard vibrational modes described by Frost and Erickson [2]. High temperature DTA/TG studies showed a thermal dehydration reaction at about 530 K and decarbonation reaction at 825 K, similar to Al based synthetic hydrotalcites.

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[1] Nijagunappa R & Naganna C (1983) *Econ. Geol.* **79**, 507-513. [2] Frost.R.L.Erickson K (2004) *Spectrochim. Acta. A* **60**, 3001. [3] Parthasarathy G *et al.* (2002) *Microporous Mesoporous Materials* **56**, 147-152.