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Transformations of NaA zeolite at high P-T conditions

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Earlier stability and electrical properties of NaA zeolite were investigated at heating, while this zeolite is comparable not much studied at high pressure, moreover at simultaneous high-T and high-P treatment.

In present work the electrical AC conductivity of synthetic powder NaA zeolite has been measured in situ at high P-T. It was shown that complex phase transformations in zeolites may be detected by impedance spectroscopy. First it was found by in vitro X-ray diffraction that NaA zeolite transforms at high P (<4.5 GPa) and high T (<400 ^{o}C) to new crystalline phases: carnegieite and nepheline family phase (/10-460/ number of PDF). At compression of both hydrated and dehydrated zeolites, the amorphization was observed growing in wide pressure range at room temperature. At heating to 200-250 ^{o}C and compression, totally amorphous materials were obtained, in which at higher pressures, new phase quickly crystallized. This amorphous-to-crystalline phase transformation occurring in short pressure range suggests a special internal short-scale order in stressed disordered material. We evident that amorphous-to-crystalline phase transformations are irreversible and post-amorphous crystalline phases are stable in wide pressure range and at pressure release. Presence of water in the system essentially changes the direction of chemical reactions leading to different products at high P-T conditions.

Present observations of formations of NaA zeolite to amorphous phase and new crystalline phases prove its low stability in respect to moderate temperatures and high pressure. The friction between powder zeolite particles plays essential role in amorphization process, which can be concerned as surface-induced transformation.

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Alteration of chromite into ferritchromite in Guleman (Turkey)

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Introduction: The surrounding materials around the chromites, with high reflection, are called "gray chromites. The term ferritchromite is used for the alteration products of chromites associated with serpentinites. Since, some authors considered that ferritchromites are not only limited to srpentinites, but in peridotites, basalts and some sediments can be present. Geochemically, ferritchromites border is enriched in Fe but impoverished in Al and Mg. The non-altered chromitic cores are relatively enriched in Al and Mg in comparison with the rims.

Descriptions: In the Guleman ophiolites (Turkey), chromites in stratiform units of Hamil- Vartinik, in a zone at the contact with metamorphic rocks (amphibolites) are highly altered and transformed into ferrichromite. Their thickness (ferritchromite) varies from 50 to 200 μm. In some cases, the chromite crystals almost entirely transformed into ferritchromite with pseudomorphic texture can be observed . The peridotite host-rocks are completely altered, but the relict olivines (Fo96) as inclusion in the chromite are preserved. In this unit two types of chromite are distinguished:

1- Disseminated chromites with 0.2 to 0.6mm in size, euhedral to subhedral, are arranged perpendicular or sub-perpendicular to the magmatic layering. This feature can be compared to chain texture described in the stratiform complexes. The average composition of these picrochromites is:
$(Cr_{9.29}Al_{5.90}Fe^{+3}_{0.74})(Mg_{5.48}Fe^{+2}_{2.46})$.

2- An arrangement of the large crystals of chromite (1 to 2mm) has formed the layering shape in the rock. The chemical differences between these two types of chromites aren't significant; the larger ones are enriched in Al and Mg, their Cr and Fe+2 content are slightly decreased. Their average structural formula can be written as:
$(Cr_{9.07}Al_{6.11}Fe^{+3}_{0.75})(Mg_{5.73}Fe^{+2}_{2.26})$.

In highly altered chromites, a distinct trend in the variation of some elements can be distinguished. Some analysis from non-altered core to altered margin are presented (fig.1) **.**

Conclusions: our studies on several tethyan ophiolites demonstrate that chromite transformation into ferritchromite is not only due to serpentinization but to subsolidus stages.

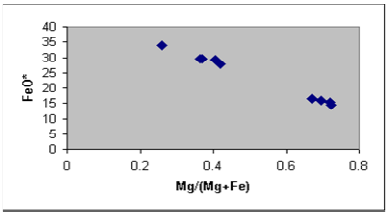

Fig.1: variation diagram for non-altered center of chromite to altered border(ferrit-chromite) with increasing FeO*.