MS17-P05 | EX-SITU STUDY OF THE PRESSURE INDUCED DECOMPOSITION OF IRON NITRIDE Fe_4N

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Although the instability of the iron nitride γ'-Fe_4N with respect to high pressure seems well established, only few studies exist which focus on the influence of pressure upon phase equilibria resulting from its transformation [1].

In this study, samples of γ'-Fe_4N powder have been exposed to pressures between 2-13 GPa and temperatures between 300-900°C in a multi-anvil press. For ex-situ study, the samples were quenched to room temperature and subsequently decompressed to atmospheric pressure. Microstructure and phase composition have been analysed by means of electron backscatter diffraction and X-ray diffraction analysis. N contents of the phases have been determined from lattice parameter data.

Our results show that both phase composition and microstructure of samples containing more than 8 at% N can be retained at ambient conditions, thus facilitating ex-situ analysis. Moreover, our data indicate a pressure induced decomposition of γ' nitride into a low-N γ-type solid solution and a high-N ε nitride. At 400°C and 4 GPa γ' nitride is still observed whereas above 6 GPa it decomposed into γ solid solution and ε nitride. At 13 GPa γ' nitride was found to transform into other phases for all treatment temperatures between 400 and 900°C.

The acquired phase constitution data were cast into a partial Fe-N pressure-temperature-composition phase diagram and provide insight into the pressure dependent evolution of the phase equilibria and potential transition reactions related with the decomposition of γ' nitride.

[1] Litasov et al., *J. Geophys. Res. Solid Earth* 2017, **122**, 3574.