ACCESSORY MINERALS IN SHOCKED ROCKS FROM THE EL'GYGYTGYN IMPACT STRUCTURE, RUSSIA; N.Z. Boctor[1], C. Koeberl[2], A. Steele[1], R.J. Hemley[1], And J. Armstrong[1], [1]carnegie Institution Of Washington, 5251 Broad Branch Rd., Nw, Washington, Dc 20015, Usa, [2]department Of Geological Sciences, University Of Vienna, Althanstrasse 14, A-1090, Vienna, Austria. Boctor@Gl.Ciw.Edu

Introduction: The El'gygytgyn impact structure is located in the central part of Chukotka Peninsula in Arctic Russia. The impact origin of the 3.6 million year old structure (18 km in diameter) was discovered by [1]. It also represents the only currently known impact structure formed in siliceous volcanic rocks; thus, it provides a unique opportunity to document shock metamorphic features in volcanic rocks [2, 3]. Clasts of volcanic rocks ranging in composition from rhyolite to dacite represent all stages of shock metamorphism including selective partial melting and formation of homogeneous impact melts. Clasts and breccias of magmatic rocks in the impact structure contain accessory minerals, such as TiO_2 and $ZrSiO_4$, which undergo high pressure phase transitions during impact [4, 5]. The high pressure polymorphs help us infer the pressure at the time of the phase transition. Some of the clasts in the El'gygytgyn structure contain crystals of rutile (TiO_2) and zircon ($ZrSiO_4$). These accessory minerals have high pressure polymorphs, which were described from other impact structures, e.g., Ries crater [5]. We also report on an uncommon REE-rich silicate phase, which has not been reported from impact structures before.

Experimental: Mineralogical and petrographic investigations and identification of shock features were carried out by optical microscopy in both transmitted and reflected light. Identification of polymorphs of TiO_2 was made initially in reflected light and crossed polars. Rutile's internal reflections were white; those of rutile II (TiO_2 αPbO_2 structure) is royal blue and akaogiite (baddeleyite-type structure) is pink. Analysis of minerals was done by the electron probe and with field emission SEM equipped by an energy dispersive system and a single wave length spectrometer. Corrections were done by standard electron microprobe methods.

Results: Rutile: In our investigation of the rutile crystals from the El'gygytgyn crater we did not find any high pressure phases. The internal reflections observed when rutile is viewed in crossed polarizers are uniformly white, unlike those of TiO_2 (αPbO_2 structure) and TiO_2 (baddeleyite-type structure), which are royal blue and pink to brown, respectively. We intend to verify the structures by X-ray micro-diffraction. TiO_2 was transformed by shock wave compression at peak pressure of 20 GPa to the αPbO_2 structure. The absence of the high pressure polymorphs of TiO_2 in our samples suggests that the pressure was <20 GPa. Alternatively, the high pressure phases formed, but reverted to the rutile structure during decompression.

Zircon: The transformation of zircon to scheelite structure occurs at 12 GPa at 900°C [6]. Under dynamic conditions, the zircon to scheelite transition begins at 30 GPa and is complete at 53 GPa [7]. $ZrSiO_4$ with scheelite structure decomposes to $ZrO_2$and stishovite at 15 to 25 GPa and 1700-2100°C [8]. In the samples we examined, we found no evidence for the zircon-scheelite transition or the breakdown of scheelite to ZrO_2 and stishovite.

REE Silicate Phase: We found a few grains of a phase highly enriched in the REE; partial analysis in wt. %: MgO 0.5, FeO 16.6, SiO_2 31.2, Al_2O_3 12.8, TiO_2 12.4, La_2O_3 6.5, Ce_2O_3 12.5.

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