EFFECTS OF SHOCK METAMORPHISM ON ZIRCONS FROM THE HAUGHTON IMPACT STRUCTURE.

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Introduction: The extreme pressure and thermal conditions attained during shock metamorphism at sometimes very limited spatial and temporal scales [1] result in unique microscopic features that remain to be fully explored in some common rock-forming minerals, including zircon. The type of shock effect(s) created in a given sample depends upon the pressures and temperatures involved as well as the composition, density and material's location in the target. This has prompted our analysis of zircon grains in variably shocked and exceptionally preserved crystalline basement assemblages of the Haughton impact structure, Canada. The purpose of this study is to identify and describe various effects in zircons grains caused by the impact event.

Results: Our results provide valuable new information regarding the effects of shock in zircon.

Shock effects in quartz and shock levels. In this sample suite it was found that quartz shows the full range of shock features including fracturing, PDFs, toasting, decrease in birefringence, diaplectic melting, full melting with loss of grain boundaries and finally flow banding. Based on these and other shock features shock levels from 1 to 7 were assigned to 52 samples of shocked crystalline material from the Haughton impact structure.

Shock effects in zircon. A number of shock effects were identified in the zircon grains. The first of these are a variety of fractures, which range from non-linear to linear. The non-linear fractures are also present in some un-shocked samples so these features do not always indicate shock. Other effects include less defined zoning and micro-faulting. Zircons that have been highly shocked show a distinct granular texture that is proposed to be due to recrystallization of the zircon.

Raman Spectroscopy. Raman spectroscopy investigations were carried out on eight zircons from various shock levels. Level 0 shows peaks at approximately 225, 292, 354, 413, 435, 819, 973 and 1003. Level 2 shows peaks at approximately 204, 223, 355, 438, 813, 973 and 999. Level 3 shows peaks at approximately 201, 222, 351, 434, 818, 973 and 1000. Level 5 shows peaks at approximately 201, 223, 355, 439, 973 and 1007. Level 6 shows peaks at approximately 201, 222, 353, 438, 972 and 1005. These results indicate mainly zircon type structures with some evidence for the scheelite-type phase and transition to reidite [2].

Summary: The shock effects identified in these samples range from shock level 1 to 7 indicating pressures ranging from 2 to 80 GPa which agrees with previously published estimates for Haughton samples [3]. The progression of shock effects seen in quartz is in keeping with other studies. A number of shock effects have been identified in zircon grains of various shock levels and raman spectroscopy investigations suggest evidence of zircon and scheelite-type phase and possible transition to reidite. [add some more text here to fill in the space]

References: [1] Langenhorst, F. 2002. *Bulletin of the Czech Geo. Survey*, 77:265–282. [2] Gucsik, A. 2007. *Workshop on Impact Cratering II.* [3] Stöffler, D. 1966. *Contributions to Mineralogy and Petrology*, 12:15-24.