PETROGRAPHIC CHARACTERIZATION OF POPIGAI IMPACT MELT-BEARING BRECCIAS A. Chanou[1], G. R. Osinski[1,2], R. A. F. Grieve[1], and D. E. Ames[3] [1]Dept. of Earth Sciences/Centre for Planetary Science and Exploration and [2]Dept. Physics and Astronomy, University of Western Ontario, 1151 Richmond St., London, Ontario, Canada N6A5B7, [3]Geological Survey of Canada, 601 Booth St., Ottawa, ON, Canada K1A 0E8 *achanou@uwo.ca

Introduction: The Popigai impact structure located in Northern Siberia, Russia (71.38° N, 111.11° E) is a 100 km in diameter structure formed 35.7 ± 0.2 Ma. The mixed target lithologies of the Popigai impact resulted in a variety of impact products. Target lithologies comprise Archaean and Lower Proterozoic gneisses, schists, igneous and sedimentary rocks [1].

This study presents the preliminary petrographic results of a suite of impact melt-bearing breccias from Popigai. The samples are brecciated impactites found beneath the coherent impact melt sheet (tagamite). These melt-bearing breccias are widely cited in the literature as 'suevites'. This petrographic characterization is part of a broader comparative study of impact-generated breccias. As a result, all melt-bearing impact breccias are examined as a single "group" with the intention of comparing and contrasting their physical and petrographic caracteristics. The ultimate goal of this comparative study is to elucidate the formation and deposition mechanisms of a variety melt-bearing breccias from different geologic contexts within impact structures.

Methods: Petrographic investigation was conducted at both the micro- and macroscopic scales. Macroscopic textural analysis (hand sample) were done with the use of digital image processing [2]. Microscopic investigation was performed using traditional optical microscopy, Scanning Electron Microscopy (SEM), and Electron Microprobe Analysis (EMPA).

Textural characterization: Popigai melt-bearing breccias display a wide array of textural characteristics. Glass particles (commonly devitrified) vary in shape, complexity and appearance. The glass fragments vary from strongly vesiculated to almost non-vesicular and from "light-coloured" to "dark-coloured". In addition, these glass fragments occasionally exhibit an internal fabric, with preferentially oriented mineral clast inclusions, and stretched vesicles that appear to have deformed along with the glass fragment. Glass particles typically contain mineral fragments of various sizes. Occasionally, mineral clasts appear to have a coating of impact-melt glass. In addition, present are lithic particles that appear as angular to subrounded fragments. The clastic content varies in size range from sample to sample.

Of interest are ~100 μm wide features of recrystallized melt that appear to be mantled by clinopyroxene rims (Fig.1). Ballen quartz crystals with fractured zircon inclusions were also observed (Fig.2).

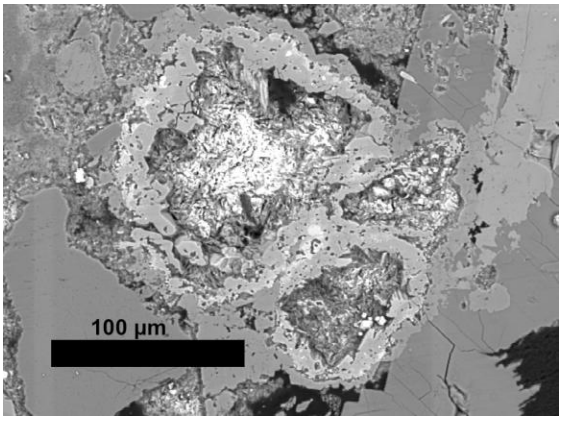

Figure 1. Backscatter image of the 100 μm wide features of mantled recrystallized melt that appears in the form of sheaf-like laths, "coated" with clinopyroxene rims.

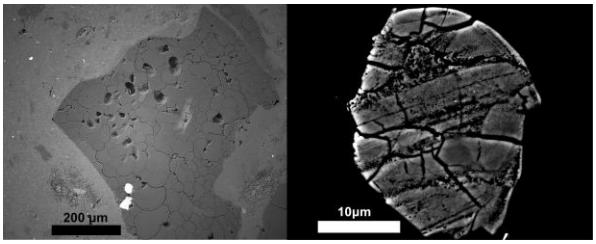

Figure 2. Ballen quartz with two zircon inclusions (left). Zircon crystal inclusion showing fracturing (right).

Preliminary chemical results suggest a mostly anhydrous aluminosilicate melt. The compositions are mainly quartzofeldspathic with the presence of Ca-rich pyroxenes. It has been observed that the clinopyroxenes have an extensively more Ca-rich composition compared to that of the impact melt rocks [3]. In addition, pyroxene aluminum content varies greatly; an observation that may reflect crystallization temperature. Generally, however, both impact melt rock and impact-melt clasts have a similar chemical composition [3]. Finally, the groundmass contains generally similar (but finer) phases as the clastic population of the breccia. It is composed mainly of comminuted plagioclase, quartz, pyroxene and some carbonate.

References: [1] Masaitis V. L. et al., (2004) *Popigai Impact Crater: Guide of geological excursions, VSEGEI Press*. [2] Chanou A. et al. (2011) LPS XLII Abstract #2164. [3] Whitehead J. et al., (2002) Mineralogy and petrology of melt rocks from the Popigai impact structure, Siberia, *Meteoritics & Planet. Sci., 37*.