Geochemical Analysis of Pseudotachylite from the Sudbury Impact Structure, Ontario, Canada

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The Archean and Proterozoic target rocks of the 1.85 Ga Sudbury Impact Structure host clast-rich pseudotachylite, locally know as Sudbury Breccia. These breccias vary from millimeter-wide veins to hundreds of meter wide clast-rich breccia zones and are often associated with rock discontinuities such as faults and lithological contacts . In general, the pseudotachylitic matrix is fine-grained to aphanitic and hosts predominantly sub- to well- rounded lithic fragments of the host-rock lithologies. The origin of the matrix as well as the general mechanism of pseudotachylite formation in large impact structures is still under discussion. Previous chemical analyses of Sudbury Breccia apparently suggest that the pseudotachylitic matrix was formed either exclusively or predominantly by in-situ, cataclastic milling to frictional melting of the host rocks (Dressler 1984, Müller-Mohr 1992), although it was noted that not all breccia material may have been derived from the immediate host rock (Dressler 1984).

Our study is aimed at testing to what extent pseudotachylitic matrix is derived from the immediate host rock or potential other sources of melt. Whole rock chemical analyses of breccia matrix-host rock pairs were analysed for major and trace element contents of various host rock types and localities from the Sudbury Impact Structure. Sample preparation was conducted specifically to obtain matrix material that contains as little as possible host rock fragments. Microprobe analyses of matrix material complement the whole rock chemical analyses. Our analyses suggest that the composition of pseudotachylitic matrix is characterized by mixing between local host rocks and melt at highly brecciated lithological contacts, despite the sporadic presence of exotic fragments. Moreover, matrices hosted within a single lithological unit (e.g. granite) differ in composition from its respective host rock. Our first results suggest considerable movement of matrix material within fragment-rich pseudotachylite zones at the Sudbury Impact Structure and/or the involvement of allochthonous material similar in compositions to average quartz-dioritic Offset Dikes that represent melt injections derived from the Sudbury Impact melt sheet.

References

Dressler B O (1984) The Effects of the Sudbury Event and the Intrusion of the Sudbury Igneous Complex on the Footwall Rocks on the Sudbury Structure. In: The Geology and Ore Deposits of the Sudbury Structure, Spec Vol 1, eds. E G Pye, A J Naldrett, P E Giblin, OGS, Toronto, pp. 97-136.

Müller-Mohr V (1992) Breccias in the Basement of a deeply-eroded impact structure, Sudbury, Canada, Tectonophisics 216, 219-226.

Rousell D H, Fedorowich J S, Dressler B O (2003) Sudbury breccia (Canada): A product of the 1850 Ma Sudbury event and host to footwall Cu-Ni-PGE deposits, Earth Science Reviews, vol. 60, pp. 147–174.

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