be essentially that of the host rock. It is apparent from grain deformation that transport distances were on the order of millimeters to centimeters along the veins.

The textures of ndile, quartz breccia, and pseudotachylite are fundamentally different when viewed petrographically. Although each of the rock types appears darkly opaque (dark gray or black) in hand specimen, the only sample with a matrix that is truly opaque in thin section is the ndile. No clasts representing compositions and textures of the other impactites have been observed in the pseudotachylite thus far. Present work is directed at determining what textural and compositional changes were involved during formation and whether the pseudotachylite represents material comparable to associated impactites.


SUDBURY PROJECT (UNIVERSITY OF MÜNSTER-ONTARIO GEOLOGICAL SURVEY): (4) ISOTOPE SYSTEMATICS SUPPORT THE IMPACT ORIGIN. A. Deutsch1, D. Buh1, P. Brockmeyer1, R. Lakomy1, and M. Flucks1, 1Institute for Planetology, University of Münster, Wilhelm-Klemm-Str. 10, D-4400, Münster, Germany, 1Institute for Geology, RU Bochum, Postfach 10 21 48, D-4630 Bochum 1, Germany.

Introduction: Within the framework of the Sudbury project [1-3] a considerable number of Sr-Nd isotope analyses were carried out on petrographically well-defined samples of different breccia units [4-7]. Together with isotope data from the literature these data are reviewed in this abstract under the aspect of a self-consistent impact model [5,8-10]. The crucial point of this model is that the Sudbury Igneous Complex (SIC) is interpreted as differentiated impact melt sheet [5,8-11] without any need for an endogenic “magmatic” component such as “impact-triggered” magmatism or “partial” m.

The Nd-Sr isotope systematics of these units, but an endo-

genic melt cannot assimilate such a high fraction of relatively cold material.

Neodymium isotope ratios of the impact melt concur with Nd characteristics of the target lithologies in the Sudbury region, for example, the Levack gneiss [12]. The observed spread in εNd reflects the widely varying (87Sr/86Sr)* = 1.85 Ga for the Archean basement [4,15], Proterozoic Intrusives [16,17], and the Huronian Supergroup [16,18] that were mixed into the melt. Distinct fields for the sublayer from different localities [12,19] in Fig. 1 show that the impact melt sheet (SIC) assimilated local bedrocks after its emplacement in the final modified crater. Strongly deviating Sr isotope ratios for some Onaping rocks in Fig. 1 with (87Sr/86Sr)* as low as 0.700 [6,7] or 0.67 [20] are due to a reopening of the Rb-Sr system during the Penokean orogeny [4, see also 7]. This is demonstrated with selected growth curves in Fig. 2: Some recrystallized melt particles and devitri
define glass have enhanced Rb/Sr ratios but the majority of the material has εNd identical to the granophyre. Together with their εNd, this fact supports our view that the melt-breccia on top of the granophyre and the melt material in the suevitic Onaping breccias and in the Green Member originated from the same source as the SIC, namely impact-melted crustal material.

Oxygen isotope data [21] support our findings. The norite, the granophyre, and the matrix of Onaping breccias all show a considerable spread in δ18O, but typical trends as known from differentiated layered intrusions are absent. The δ18O values of these lithologies are bracketed by oxygen isotopic compositions observed for local Archean and Proterozoic bedrocks with the Onaping breccias reflecting a higher input of Huronian greywackes. To explain the Os isotope ratios for the Sudbury ores [22] by mixing between a mantle magma and crust would need up to 90% crustal material. Therefore these data are also in line with a derivation of the ores exclusively from ancient crustal sources by impact melting followed by segregation of a sulfide liquid out of the melt sheet.

Summary and Outlook: While in the original contributions SIC isotope systematics were discussed preferentially in terms of a possible mixing between a hypothetical mantle component with up to 75% crustal material, the impact melt model does not have any problem explaining the crustal signatures of the SIC, the Onaping breccias, and the Sudbury ores—total melting of basement and supracrustal lithologies can only produce crustal signatures. Future studies on Sudbury should concentrate on combined analyses of
stabilized and radiogenic isotopes on petrographically defined samples in order to understand the mixing process in impact melts in more detail. Isotope data could also help to decipher the complex process of assimilation by a large hot impact melt sheet for both lithic fragments and crater floor lithologies.