

**NEW K-AR DATING ON IMPACT-GENERATED MELT FROM THE CARSWELL ASTROBLEME, EVIDENCE FOR A MESOPROTEROZOIC IMPACT EVENT**

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The Carswell astrobleme is situated in NW Saskatchewan (Canada), in the Paleoproterozoic Athabasca Basin. It is a 39 km-wide complex impact structure with an 18 km diameter central uplift made of crystalline basement rocks. The age of the impact event has never been accurately constrained: a very large range of ages has been found from 115 to 515 Ma [1, 2, 3, 4, 5], though the distribution of shock metamorphism features, restricted to the basement rocks, suggests a pre-Athabasca age [6, 7]. Because several occurrences of uranium have been discovered at the basement-sediment unconformity as in some breccias from the central uplift, it is essential to determine the age of the impact event and its possible influence on the mineralization.

This work provides new K-Ar dating of impact generated melt sampled in the shocked crystalline rocks of the central core: two samples of impacted breccias collected in drill-cores (CLU02-00, CLU4667-92) and one from an outcrop near the unconformity (CLU02-Af). Shock metamorphism features observed are relevant of high PT conditions ~60GPa and >1500°C (stage I to IV [8]), sufficient for the resetting of K-Ar isotopic system by the impact event. Thirteen measurements were conducted in different separates: a mixture of melt and fine grained host rock fragments gave weighted averages of 1194±15 Ma (CLU02-00), 1092±54 Ma (CLU4667-92) and 511±12 Ma (CLU02-Af), pure melt yielded a 1026±25 Ma age and feldspar directly in contact with the melt a mean at 1116±36 Ma (both in CLU4667-92).

The youngest result ca. 510 Ma is consistent with previous K-Ar and Ar-Ar ages [3, 5], but the rest of our data ranging between 1.1 and 1.2 Ga were previously unknown. We interpret our oldest result at 1194±15 Ma as the minimal age for the impact event. The presence of a chloritized clay material in the matrix of sample CLU02-Af could explain the youngest ages, assuming a local and late hydrothermal event partly resetting the clock. Moreover, the main stage of U mineralization emplaced in the Carswell structure evaluated between 1050 and 1150 Ma by U-Pb dating method [9] is much younger than for the other unconformity-type U deposits elsewhere in the Athabasca Basin and aged from 1350 to 1560 Ma [10]. We suggest that either the U-Pb isotopic system of U-minerals within the astrobleme has been reset by the thermal impact effect or that secondary crystallization happened consecutive to the impact event, facilitated by fracturing and brecciation. Considering these new data, the Carswell impact event is thought to be of Mesoproterozoic age.

**References:** [1] Wanless R.K. et al. 1968. *GSC Rep.* 8, Pap. 67-2, part A, 141 p. [2] Currie K.L. 1969. *GSC Pap.* 67-32, 69 p. [3] von Einsiedel C.A. 1981. B.Sc. thesis, Carleton Univ. (ON, Canada) 44 p. [4] Bottomley, R.J. 1982. Ph.D. thesis, Toronto Univ. (ON, Canada) 104 p. [5] Bell, K. 1985. *GAC Spe. Pap.* 29, 33-46 [6] Duhamel I. et al. 2005. *Meteoritics & Planetary Science* 40 (9) Supp., A41 (Abs.) [7] Duhamel I. 2006. M.Sc. thesis, UQAM (QC, Canada), 188 p. [8] French, B.M., 1998, *LPI Contrib.* 954, 120 p. [9] Tona et al. 1985. *GAC, Spe. Pap.* 29, 1-18. [10] Alexandre P. et al. 2009. *Mineralium Deposita* 44, 41-59.