Application of the Re-Os and Sm-Nd isotope decay couples to dating of unconformity-related U deposits

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^{147}Sm-^{143}Nd isotope decay couple was applied to hydrothermally altered basement and basin lithologies as well as to mulltiple U-mineralised bulk samples and U oxides locally sampled from massive pitchblendes of 2 unconformity related Proterozoic U deposits: Cigar Lake (Canada) and Jabiluka (Australia). For the Jabiluka deposit the Sm-Nd isotope systematics confirm a co-genetic formation of the hydrothermal alteration of the basement rocks and the U mineralization with insignificant post-crystallization fluid alteration events.

Results will also be presented for the ^{187}Re-^{187}Os radiometric couple applied to rammelsbergite ($NiAs_2$), which is often present in the form of veins in the uranium deposits of the Athabasca Basin. Considering the high and variable Re concentrations, insignificant common Os and substantial resistance of rammelsbergite to multiple post-emplacement hydrothermal events, the ^{187}Re-^{187}Os isotope system applied to the massive rammelsbergite veins proved to be a powerful dating tool. The ^{187}Re-^{187}Os age of the vein rammelsbergite emplacement in the Cigar Lake deposit post-dates the primary uranium oxides, which formed at 1341 – 1461 Ma [1, 2]. The age of the nickel arsenide emplacement is similar to the age of the stage 2 remobilized uranium oxides (1163 – 1270 Ma [2, 3]) and is broadly similar to the age of the Mesoproterozoic magmatic Mackenzie event (1269 Ma [4]).

[1] Philippe *et al.*, (1993) *Can. J. Earth Sci.* **30**, 720–730. [2] Fayek *et al. Chem. Geol.* **185**, 205–225. [3] Kaczowka (2017) *Queen's University Kingston, master dissertation*. [4] Mackie *et al.* (2009) *Precambrian Res.* **172**, 46–66.