Origin of uranium deposits revealed by their rare earth element signature

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Uranium deposits have formed in a wide range of geological settings including deep metamorphic/magmatic to surficial conditions and range in age from Archean to recent time. These temporal and spatial variations have given rise to an extreme diversity of deposits [1]. However, understanding their genesis and exploring for uranium deposits have remained challenging. In particular, very limited link between trace element or isotopic composition of uranium oxide and the conditions for their accumulation to economic grades have been clearly established.
Here we report REE abundances in uranium oxides, measured by microbeam methods (SIMS and LA-ICP-MS), for a series of 20 worldwide uranium occurrences from six of the major uranium deposit types. This study demonstrates that the REE contents of uranium oxides are very specific to each deposit type, regardless of the age or variations in local geological settings. Thus, REE abundances reflect directly the mineralising processes specific to each deposit type. We propose an evaluation of the first order parameters (T, REE sources and fluid composition) controlling the REE behaviour in each mineralized system. When applied to giant unconformity-related deposits, REE abundances enable to better understand their formation. Our results demonstrate that the REE patterns of uranium oxides are powerful tools for refining metallogenic models, and a key for the definition of the genetic model of new uranium discoveries [2].

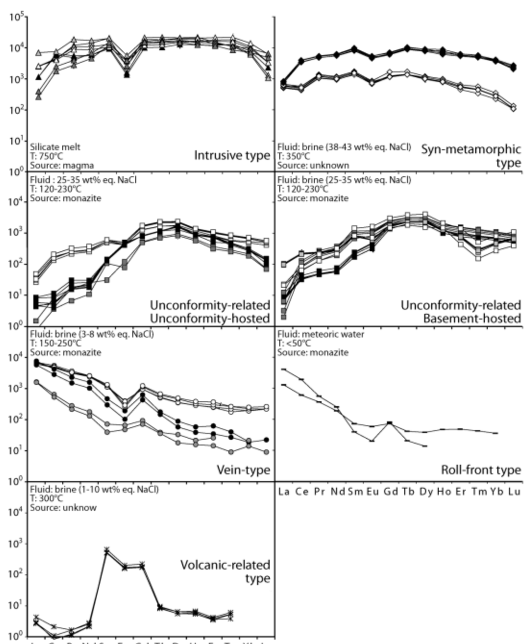

Figure 1:chondrite-normalized REE patterns of uranium oxides for six different types of worldwide U deposits. Source : source of REE

[1] Cuney (2009) *Mineralium Deposita* **44**, 3-9. [2] Mercadier et al. (2011) *Terra Nova* **23**, 264-269.