

## **Distribution coefficient of uranium in aragonitic travertines at Fitero thermal springs (Spain)**

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The aragonitic travertines generated in the springs of the Fitero thermal system have been studied to assess the distribution coefficient ( $K_d$ ) of uranium between aragonite and the parental aqueous solution. The knowledge of  $K_d$  in non marine, inorganic aragonite is limited [1], although it can be of great interest as paleoenvironmental record [1] and also for the better understanding of the behaviour of this element, and the possibilities of remedation in contaminated sites [2].

The measured pH of the emerging waters is 6.5 and the spring temperature is close to 50 °C. The travertine samples were taken at the end of one of the pipes that drain the thermal water from the spa and the precipitation takes place at 40 °C. These travertines consist of an intercalation of dark and clear bands of less than 1 cm of thickness. The dark bands are constituted by aragonite and minor amounts of goethite and the clear bands by aragonite and minor amounts of calcite.

Clear and dark bands were analysed separately as slight differences are expected depending on the dominant carbonate phase: calcite cristallographic structure incorporates less uranium than aragonite [1, 3]. The  $K_d$  was calculated for the two types of bands as  $K_d = (U/Ca)_{\text{aragonite}}/(U/Ca)_{\text{water}}$ , where a  $K_d > 1$  indicates that uranium incorporation into aragonite is favoured whilst a  $K_d < 1$  means that uranium is not easily incorporated.

The calculated  $K_d$  are slightly lower in the clear bands since they contain calcite. The  $K_d$  calculated for the dark bands is in the range 3.14 to 4.03 and for the clear bands is in the range of 3.04 to 3.79.

In both cases, the values higher than 1, agree with recent estimations for aragonitic speleothems [1] and indicate that uranium is easily included in the aragonite structure and, therefore, that these mineralogical phase can retain this element in significant proportions.

[1] Wassenburg *et al.* (2016) *Geochim. Cosmochim. Acta* **190**, 347-367. [2] Sutton (2009) *LLNL-SR-415700*. [3] Meece & Benninger (1993) *Geochim. Cosmochim. Acta* **57**, 1447 – 1448.