

# **U-Pb age and geochemical characteristics of travertine from Balochistan, Pakistan: a possible reference material for U-Pb geochronology of carbonate minerals**

MAYUKO FUKUYAMA<sup>1\*</sup>, MASATSUGU OGASAWARA<sup>2</sup>,  
AND REHANUL HUQ SIDDIQUI<sup>3</sup>

<sup>1</sup> Akita University, Akita, 010-8502, Japan (\*  
correspondence: mayuko@gipc.akita-u.ac.jp)

<sup>2</sup> Geological Survey of Japan, AIST

<sup>3</sup> Balochistan University of Information Technology,  
Engineering and Management Science

In-situ U-Pb dating of carbonate minerals is recently applied for calcite samples with various origin. Reference materials for U-Pb dating of calcite, such as WC-1 ( $254.4 \pm 6.4$  Ma [1]) and ASH-15D ( $3.001 \pm 0.012$  Ma [3, 4]), are available from several laboratories. In this study, we present the suitability of a travertine sample (PKC-1) from Chagai, Balochistan, Pakistan for use as a U-Pb dating reference material of Quaternary age. The travertine is commonly known as Onyx Marble, and is used as ornamental stone.

The Plio-Pleistocene Koh-e-Sultan volcanic rocks occur in the Chagai volcanic arc in the western part of Pakistan. These are represented by andesite to dacite lava flow and volcanoclastics [5]. The travertine occurs near the Koh-e-Sultan volcanic rocks, and shows layered structure with different color from white, green to brown. Green and brown parts consist of calcite. White color part consists of calcite + aragonite. Sr isotopic compositions of the travertines are same as those of dacites of the Koh-e-Sultan, suggesting that it formed from hot spring related to the volcanic activity.

U-Pb dating of PKC-1 was attempted with the solution ICP-MS as well as the LA-ICP-MS utilize a New Wave Research 193UC excimer laser ablation system, coupled to a Nu Instruments Nu Plasma II multi-collector ICP-MS or Agilent 7700 quadrupole ICP-MS. The result shows age of  $2.4 \pm 0.12$  Ma (MSWD=0.86). It shows a mixing array between radiogenic and common Pb with relatively low common Pb. PKC-1 contains high U contents (6-74  $\mu\text{g/g}$ ) and low Th contents ( $\sim 0.0002$   $\mu\text{g/g}$ ). Uranium concentration is positively correlated with Fe concentration. The travertine PKC-1 can be a suitable reference material for the dating of calcite of Quaternary age.

[1] Roberts *et al.* (2007) *G3*, 10.1002/2016GC006784 [2] Mason *et al.* (2013) *Geostand. Geoanalytical Res.* **37**, 261-275. [3] Vaks *et al.* (2013) *EPSL*, **368**, 88-100. [4] Siddiqui *et al.* (2009) *JHES*, **42**, 1-24.