The chronology of basaltic lunar meteorite Northwest Africa 10597

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Introduction: The lunar meteorite NWA 10597 is unbrecciated basalt, which is one of the representative meteorites of young and evolved lunar volcanic rocks [1]. NWA 10597 has been reported paired with NWA 4734 [2], which shows a large age range from 2720 Ma to 3083 Ma [3-5]. In this study, we carried out a detailed investigation on the U-Pb isotopic age of the lunar basalt.

Method: The U-bearing accessory minerals of NWA 10597 are mainly Ca-phosphate (apatite and merrillite). *In–situ* U-Pb dating analysis was performed on a Sensitive High Resolution Ion Micro Probe (SHRIMP II) . In order to increase the stability of the dating, a Kohler focusing mode was used to o btain a uniform-density beam size of ~10 μm.

Results: The results show that the $^{207}Pb/^{206}Pb$ ages of phosphates range from 2980 Ma to 3300 Ma, with 4 peak ages of ~3010 Ma, ~3060 Ma, ~3130 Ma, and ~3180 Ma. Moreover, there are also 4 analyses that reveal ages between 3200 Ma and 3300 Ma.

Discussion & conclusions: The ages of ~3010 Ma, ~3060 Ma, ~3130 Ma, and ~3180 Ma suggest four episodic magmatisms. The youngest Pb-Pb age of ~3010 Ma reflects the final crystallization time of the meteorite. However, the ages between 3200 Ma and 3300 Ma represent older thermal events.

References: [1] Chen J., et al. 2019. J. Geophys. Res.: Planets, 124: 2583–2598. [2] Wu Y., et al. 2020. Icarus, 338: 113531. [3] Wang Y., et al. 2012. Geochim. Cosmochim. Acta, 92 : 329–344. [4] Fernandes V. A., et al. 2009, Lunar Planet. Sci. 40th Abstract #1045. [5] Elardo S. M. et al. 2014. Meteorit. & Planet. Sci. 49: 261-291