Confirming the KREEP-rich nature of the parental melt of noritic anorthosite in Apollo 16 breccia 67955 using Pb-Pb systematics

THOMAS HABER1, ANA ČERNOK2,3, HARRY BECKER2
AND ERIK E. SCHERER1

1Universität Münster
2Freie Universität Berlin, Institut für Geologische Wissenschaften
3School of Physical Sciences, The Open University

Presenting Author: thomas.haber@uni-muenster.de

The overwhelming majority of impactites at the Apollo landing sites were generated by basin-forming impacts [e.g., 1]. However, even when such rocks can be successfully dated, identifying their corresponding impact basin is challenging [e.g., 2]. Nevertheless, establishing such links is vital for a better understanding of lunar impact chronology and can be demonstrated using the example of breccia 67955. Noritic anorthosite portions of this rock have been previously dated with a 147Sm-143Nd isochron [4200 ±70 Ma; 3] and with U-Pb on low-U zirconolite [4.22 ±0.01 Ga; 4] and zircon [4211 ±4 Ma; 5]. Trace element compositions indicated that this sample crystallized as a cumulate from a KREEP-rich impact melt sheet [3]. Together, these data point to a ~4.2 Ga basin impact within the Procellarum-KREEP Terrane.

Working on a separate split of the same rock, we had previously produced a neutron capture corrected [6, 7] 147Sm-143Nd isochron [4201 ±45 Ma; 8], confirming the sample age. We have acquired new 207Pb/206Pb data, obtained by stepwise digestion [e.g., 9], that also yield a ~4.2 Ga crystallization age, and allow testing for an inherited KREEP component: These Pb-Pb data indicate that that the source(s) of the melt from which 67955 crystallized had a µ-value ([238U/204Pb]) of ~2000. This is significantly higher than that of 544 obtained by [10] for 67955 itself and is a typical KREEP signature [e.g., 11, 12]. Statistically, ~4.2 Ga impactites at the Apollo 16 landing site were most likely derived from Serenitatis or Nectaris [1], with the confirmed KREEP-rich nature of the parental melt favoring Serenitatis.