NOBLE GAS RETENTION AGES OF ANGRITES NWA 1296, NWA 2999/4931, NWA 4590 AND NWA 4801.

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Introduction: It has been reported that three angrites NWA 2999/4931 (N29/49), NWA 4590 (N45), NWA 4801 (N48) contain ^{244}Pu-derived Xe ($T_{1/2}$ ~ 80 Myr) [1], indicative of very ancient formation. Here we report new noble gas data for angrite NWA 1296 (N12), and calculate Pu-Xe ages and U/Th-^{4}He ages based on noble gas data and chemical compositions [2-4].

NWA 1296: He, Ne and Ar are dominated by spallogenic and radiogenic components. The ^{3}He exposure age (0.6 Ma) is shorter than those of ^{21}Ne and ^{38}Ar (2.3 Ma on average), suggesting ^{3}He loss during the transit to the Earth. Kr may be affected by terrestrial contamination, and ^{81}Kr exposure age cannot be estimated. Xe is dominated by spallogenic and ^{244}Pu-derived Xe. No ^{129}Xe excess from ^{129}I decay ($T_{1/2}$ ~ 16 Myr) is observed, despite the fact that this angrite has an Al-Mg age of 4561 Ma [5].

U/Th-^{4}He ages: The U/Th-^{4}He ages of the four angrites studied are estimated as 170 - 4480 Ma (<3 % contribution of α-decay of ^{244}Pu), indicating radiogenic ^{4}He loss. Given the ^{3}He exposure ages comparable to those of ^{21}Ne, ^{38}Ar and ^{81}Kr (except for N12), the radiogenic ^{4}He would have been lost by parent body processes. For N12, the radiogenic ^{4}He loss could have also occurred with spallogenic ^{3}He loss during the meteoroid flight.

Pu-Xe ages: The ^{244}Pu-^{136}Xe ages relative to Angra dos Reis (ADOR) are estimated in two ways: method (i) using ^{150}Nd as proxy for the primordial ^{244}Pu content [6] and method (ii) using spallogenic ^{126}Xe as proxy for ^{150}Nd [7]. The Pu-Xe ages of N12 estimated by the both methods and those of N29/49 estimated by method (i) are almost zero within the errors, suggesting contemporaneous formation with ADOR. Method (ii) gives extremely old ages for N29/49, because of high Ba content due to terrestrial contamination [8]. The Pu-Xe ages of N45 and N48 obtained by the two methods exceed zero even if taking 2σ errors. Given the Pb-Pb ages of N45 and N48 comparable to that of ADOR (~ 4558 Ma; [9]), the old Pu-Xe ages are attributed to overabundant fission ^{136}Xe, i.e., parentless fission Xe. The parent body processes may not have affected fission Xe, but may have led to significant loss of radiogenic ^{4}He.

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References: [1] Nakashima D. et al. 2008. *Meteoritics & Planetary Science* 43:A112. [2] Shirai N. et al. 2008. *Meteoritics & Planetary Science* 43:A144; Shirai N. et al. 2009. *Lunar & Planetary Science* XL, #2122. [3] Jambon A. et al. 2005. *Meteoritics & Planetary Science* 40: 361-375. [4] Gellissen M. et al. 2007. *Lunar & Planetary Science XXXVIII*, #1612. [5] Baker J. et al. 2005. *Nature* 436: 1127-1131. [6] Lugmair G. W. and Marti K. 1977. *Earth & Planetary Science Letters* 35: 273-284. [7] Eugster O. et al. 1991. *Geochimica et Cosmochimica Acta* 55: 2957-2964. [8] Al-Kathiri A. et al. 2005. *Meteoritics & Planetary Science* 40:1215-1239. [9] Amelin Y. and Irving A. J. 2007. *LPI Workshop on Chronology of Meteorites*, #4061.