

Rb-Sr systematics of the ungrouped achondrites

E.A. KRESTIANINOV^{1*} AND Y.AMELIN¹

¹Research School of Earth Sciences, The Australian National University (*evgenii.krestianinov@anu.edu.au)

Initial Sr chronometry was proposed by [1] and based on different condensation temperature of Rb ($\approx 800\text{K}$) and Sr ($\approx 1465\text{K}$) [2]. It allows estimating the time of separation of the low-Rb/Sr achondrite precursors from high-Rb/Sr solar nebula [3] by comparing initial $^{87}\text{Sr}/^{86}\text{Sr}$ of CAIs [4] and achondrites.

We analysed Rb-Sr system of eight achondrites: Ibitira, Asuka 881394, NWA 11119, eucrite NWA 8661, NWA 6704, NWA 4587, NWA 7325, and ureilite ALM-A. Two plagioclase fractions from each meteorite (for NWA 4587 whole-rock fractions) were ultrasonically cleaned, then one was leached in cold 0.5M HNO_3 and hot 6M HCL with dissolution in the mixture of HF and HNO_3 , while the second fraction was dissolved without acid leaching. Sr was separated using cation exchange chromatography with Sr Spec resin and measured by three-line multidynamic method on the Triton Plus at RSES, ANU.

For our set of achondrites, we have got following initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios: 0.698961 ± 0.000016 for Ibitira, 0.698972 ± 0.000008 for Asuka 881394, 0.698934 ± 0.000026 for NWA 11119, 0.699004 ± 0.000004 for NWA 7325, 0.698982 ± 0.000011 for NWA 8661, 0.698995 ± 0.000025 for NWA 6704, and 0.6990242 ± 0.0000076 for NWA 4587. ALM-A has high measured $^{87}\text{Sr}/^{86}\text{Sr}$ of 0.703521 ± 0.000007 and therefore gives an imprecise initial value of 0.699050 ± 0.000118 .

Our results show that, while the initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of other achondrites are higher than the CAI value [4], and are apparently suitable for evaluation of the accretion timing, the initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of Ibitira and Asuka 881394 are indistinguishable from the CAIs value, and NWA 11119 has the lowest initial $^{87}\text{Sr}/^{86}\text{Sr}$ measured in achondrites so far that is ~ 0.6 ϵ -units below the CAI value. These data and recent findings of CAIs with variable initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios [5] suggest heterogeneous distribution of $^{87}\text{Sr}/^{86}\text{Sr}$ in the solar nebula and complicate age determination with the initial $^{87}\text{Sr}/^{86}\text{Sr}$ chronometry.

[1] Papanastassiou, D. A. and G. J. Wasserburg (1969) *EPSL*, 5, 361-376. [2] Lodders, K. (2003) *AJ*, 2, 1220-1247. [3] Halliday, A. N. and D. Porcelli (2001) *EPSL*, 4, 545-559. [4] Hans, U., et al. (2013) *EPSL*, 374, 204-214. [5] Di, Y. and Y. Amelin (2020), *LPSC*, 1132.