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Closed system step etching (CSSE) of MIL 090657 reveals significant primordial, possibly new, noble gas components in soluble phases.

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Most known carriers of primordial noble gas components in primitive carbonaceous chondrites are acid-resistant [1]. However, there is evidence for significant primordial gases residing in acid-soluble phases [2]. Here, we present a complete characterization of the noble gas inventory in the very primitive CR MIL 090657 by CSSE, using H₂O, acetic acid (HAc), HNO₃, HF, and HCl. H₂O treatment released surprisingly large amounts of light noble gases, with Ne close to trapped components, distinct from air, and in the range of Q. However, a release of proper Q is ruled out based on the lack of major Kr and Xe. A main fraction of the total expected ^(36,38)Ar was released by etching with HAc. Thus, with HAc, we likely dissolved the Ar-rich carrier, which is opened upon moderate parent body aqueous alteration [3,4]. The elemental and Ne isotope ratios differ from any known components [1]. Hence, these two etch runs possibly delivered a new noble gas component each with carriers that still need to be constrained. Details of all five etch runs and results from XRD will be presented at the meeting.

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[1] Ott, U. (2014) Chem. d. Erde 74, 519-544. [2] Matsuda, J. et al. (1980) GCA 44, 1891-1874. [3] Weimer, D. et al. (2017) 80th MetSoc, #6300. [4] Busemann, H. et al. (2019) 82nd MetSoc, #6383.

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