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NOBLE GASES IN THE NEW CI CHONDRITE OUED CHEBEIKA 002:PRIMORDIAL COMPONENTS AND COSMIC RAY EXPOSURE AGE

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Carbonaceous chondrites of CI type are among the most primitive materials found in the solar system with chemical composition very close to the solar one and are crucial to understand the delivery of volatile elements to planets [1,2]. Only ten CI chondrites have been found on Earth. Two recent space missions returning samples from asteroids reveal striking similarities between Ryugu (Hayabusa2), Bennu (OREx) samples and CI meteorites [3,4].

We present measurements of the elemental and isotopic composition of Ne, Ar, Kr and Xe released by laser heating steps of three 1 mg bulk samples from a new CI1 chondrite, Oued Chebeika 002, freshly found in 2024 [5].

Neon (Fig1) consists in a pure mixture between cosmogenic Ne and a primordial component (Ne-A [6]) trapped in carbonaceous chondrites, corresponding to a mixture of different subcomponents, including presolar neon found in meteoritic nanodiamonds (Ne-HL). The fact that all heating steps plot toward the same trapped component suggests a homogeneous distribution of presolar grains in the samples. The results do not show evidence for atmospheric contamination.

Cosmogenic ^{21}Ne together with estimates for the production rate are used to compute a cosmic ray exposure age of 4.3 ± 0.6, similar than the age given for Orgueil (2.78 ± 0.92 [7]) and for Ivuna (3.03 ± 1.00 [7]) suggesting a common ejection event.

The xenon isotopic composition (Fig2), similarly to Orgueil [7], corresponds to a mixture between Xe-Q [8] and Xe hosted in presolar grains (Xe-HL). Two samples display high ^{129}Xe/^{132}Xe ratios, due to the presence of radiogenic ^{129}Xe produced from the β-decay of now extinct ^{129}I.

Fig1 - Ne isotopic composition for each heating steps.

Fig2 - Xe isotopic composition for each heating steps.

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