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O isotope variations in IIIAB iron meteorites

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The IIIABs are a magmatic iron group that probably sample the core of a protoplanet [1]. We conducted high-precision oxygen isotope analyses on chromites from 9 IIIABs. We find that the oxygen isotopes of the group are not homogenous and that three populations that are resolvable. The first has $\delta^{18}\text{O} = -1.15 \pm 0.67 \text{‰}$ (2σ), $\Delta^{17}\text{O} = -0.170 \pm 0.048 \text{‰}$ (2σ), the second group $\delta^{18}\text{O} = 0.88 \pm 0.47 \text{‰}$ (2σ), $\Delta^{17}\text{O} = -0.181 \pm 0.030 \text{‰}$ (2σ), and the third group $\delta^{18}\text{O} = 7.49 \pm 0.80 \text{‰}$ (2σ), $\Delta^{17}\text{O} = -0.286 \pm 0.048 \text{‰}$ (2σ). We forward two possible explanations for these variations. Firstly, the IIIAB iron group could sample multiple parent bodies. This would suggest that the chemical classification scheme cannot resolve parent body differences in some iron groups and that there may have been more differentiated planetesimals in the early solar system than previously thought. Alternatively, the three subgroups may sample different melt pools separated by a process such as dendritic crystallization [e.g., 2, 3].

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Press, Tucson 747-771.

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Cite abstract as:

Windmill, R.J., Franchi, I.A., Anand, M., Greenwood, R.C. (2021) O isotope variations in IIIAB iron meteorites. Paneth Kolloquium, Online (Germany), abstract URL: <https://paneth.eu/PanethKolloquium/2021/0039.pdf> (abstract #0039).