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# Distribution of element abundances within achondrites
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Our understanding of the history of the solar system relies heavily on the analysis of meteorites. Many meteorites that fall to earth are achondrites, which are derived from the moon, mars (shergottites, nakhlites, chassignites) or from asteroid parent bodies (eucrites, howardites, diogenites, ureilites, iron meteorites etc). The chemistry and petrology of the different chemical groups of achondrites is known to differ substantially, which raises the question as to whether there are also major chemical differences within each/any of the various achondrite chemical groups.

To help answer this question we utilized a database that we compiled from meteorite element abundances and terrestrial from peer-reviewed papers, building on existing published databases [1-4]: we then used element abundances from these databases to analyze the major, minor and trace elements chemistry of achondrites. The meteorite database comprises 28,742 bulk chemical abundances from 2,112 meteorites compiled from 121 peer-reviewed papers published between 1953 and 2010: representing 78 atomic elements, 20 major chemistry analyses and a wide range of petrologic and chemical types. The terrestrial database comprises 71,245 bulk chemical abundances compiled from 2,848 rocks, from 66 peer-reviewed papers published between 1982 and 2011.

The results of our analysis suggest that there is no significant difference in major chemistry of most meteorites within the majority of achondrite groups. However, there can be significant differences in major chemistry for aubrites and iron meteorites. We also find that lodranites, aubrites and some meteorites from the moon and mars can also contain anomalous metal and trace elements. These anomalous element abundances often differ by many times the mean of their particular achondrite group, which might suggest that metals and other atomic elements have been injected/ depleted by hydrothermal/alteration or by other processes.

We found it difficult to analyze the major chemistry of iron meteorites due to a lack (absence) of major chemical abundances. Given that most iron mines on Earth use major chemistry for rock/material type interpretation we recommend a concerted effort to obtain better coverage of the major chemistry of iron meteorites.

The implication of this research is that a potential might exist for finding metal and trace element resources on the moon, mars, or even on some asteroid parent bodies.

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