# Missing chromium is clue to planet formation

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Early in the formation of the Earth, some forms of the element chromium separated and disappeared deep into the planet's core, a new study by UC Davis geologists shows.

The finding, to be published online by the journal *Science* Feb. 24, will help scientists understand the early stages of planet formation, said Qing-Zhu Yin, professor of geology at UC Davis and coauthor on the paper.

Yin, former postdoctoral scholar Frederic Moynier and Edwin Schauble of the Department and Earth and Space Sciences at UCLA used specialized equipment at UC Davis to make very exact measurements of chromium isotopes in meteorites, compared to rocks from the Earth's crust, and use modern high performance computers to simulate early Earth environment.

They studied a class of meteorites called chondrites, which are leftovers from the formation of the solar system over four and half billion years ago.

As well as adding shiny, rust-proof surfaces to metalwork, chromium adds color to emeralds and rubies. It exists as four stable (non-radioactive) isotopes with atomic masses of 50, 52, 53 and 54.

It has been known for decades that chromium isotopes are relatively underrepresented in the Earth's mantle and crust, Yin said. That could either be because they were volatile and evaporated into space, or got

sucked into the Earth's deep core at some point.

By making very accurate measurements of chromium isotopes in the meteorites compared to Earth rocks and comparing them to theoretical predictions, the researchers were able to show for the first time that the lighter isotopes preferentially go into the core. From this the team inferred that some 65 percent of the missing chromium is most likely in the Earth's core.

Furthermore, the separation must have happened early in the planet building process, probably in the multiple smaller bodies that assembled into the Earth or when the Earth was still molten but smaller than today.

Provided by University of California - Davis

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