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Maghemite soil nodules reveal the impact of fire on mineralogical and geochemical differentiation at the Earth's surface

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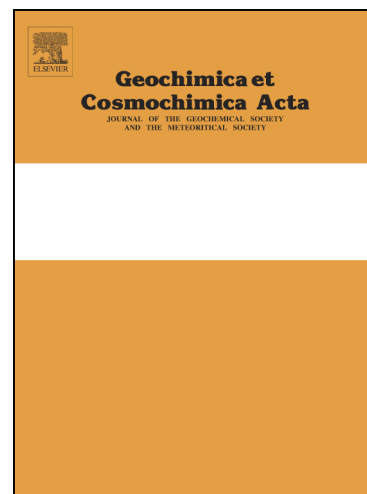
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1 **Maghemite soil nodules reveal the impact of fire on mineralogical and**
2 **geochemical differentiation at the Earth's surface**

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12 **Abstract**

13 Fires occur frequently over large parts of the Earth's surface. They potentially exert a
14 significant influence on the mineralogical and geochemical characteristics of an
15 environment that is otherwise considered to be dominated by low temperature
16 processes. We test this hypothesis by comparing the mineralogy and geochemistry of
17 i) magnetic, iron-rich soil nodules, ii) non-magnetic iron soil nodules and iii) a
18 published dataset of surficial sediments from Eastern Australia.

19 Maghemite-rich nodules are present in soils from around the world. It has been argued
20 that they are thermal alteration products of non-magnetic precursors, but this remains
21 controversial. We use detailed petrographic and mineralogical analyses to
22 demonstrate that maghemite occurs as part of a high temperature mineral assemblage
23 including hematite and χ -alumina, within a magnetic nodule microfabric indicative of
24 fire-induced dehydroxylation and sintering of non-magnetic precursors at

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