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Stability field of tuite and its potential as a volatile carrier.

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Phosphorus and volatiles bound in Ca-phosphates affect processes in the Earth's interior including partial melting and element partitioning, transport and redistribution. The anhydrous Ca-phosphate tuite, which is stable after the breakdown of apatite, has the potential to host incompatible trace elements [1], however its suitability as a volatile carrier and its stability field in the major lithologies of the subducting lithosphere remain to be explored. Experiments were performed using a spinel lherzolite doped with $\beta\text{-Ca}_3(\text{PO}_4)_2$ and a trace element mix at pressures ranging from 15 to 25 GPa and between 1600 and 2000°C. First results show that in the pressure range of 20-25 GPa, tuite breaks down between 1600°C and 1800°C. At 20 GPa/1600°C, tuite coexists with, amongst others, partial melt and majorite. At 25 GPa/1600°C, after the breakdown of majorite, tuite is the main phosphorus carrying mineral and its role as a host for trace elements might be particularly relevant.

[1] Zhai S. et al., (2014) Sci China: Earth Sci., 57,2922–2927.

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