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Sheared peridotites from Kimberley (South Africa): Connecting deformation and metasomatism?

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Sheared peridotites from the subcratonic mantle are the result of strong deformation shortly before entrainment. We analyzed 14 samples from Kimberley (RSA) for major and trace elements and measured crystal preferred orientations (CPO) by EBSD to investigate the process of deformation and its possible connection to metasomatism.

Ti-enrichment is observed in olivine and opx neoblasts along with an increase in trace element contents, which imply a T increase of >200°C compared to that recorded by porphyroclastic grains. Occasionally this metasomatism also led to the crystallization of Ti-oxides and new clinopyroxene. The CPOs suggest a water-rich metasomatic agent was present at the time of deformation and neoblast re-crystallization. On the other hand, LA-ICP-MS measurements reveal possible metasomatic events, which affected the peridotite prior to deformation and which are preserved in the cores of porphyroclastic grains (e.g. garnet). These data suggest a complex history of different metasomatic events in the deeper subcratonic mantle.

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