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Re-equilibration of glass and CO_2 inclusions in xenolith olivine: A TEM study

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ABSTRACT

CO_2-rich fluid inclusions were observed in olivine from mantle xenoliths from the Island of Tenerife, Canary Islands. Inclusions that are present in deformed olivine porphyroclasts consist of CO_2 fluids + minor high-alkali, silica-rich glass ± Ni-Fe sulfides. Homogenization temperature distributions reveal that most of the inclusions (originally trapped at mantle conditions) re-equilibrated to lower density values.

Transmission electron microscope (TEM) studies indicate that most fluid inclusions appear as perfectly euhedral negative crystals, with variable shape (from prismatic to equant), size (from <0.02 to 0.15 μm), and inner texture. Different kinds of negative crystals may coexist in the same trail of inclusions. Inclusions are commonly connected to structural defects (dislocation arrays formed after fracture healing), which represent a possible path for leakage of the fluid phase. These microstructures, undetectable by optical microscopy, could have modified the original composition and/or density of the inclusions through CO_2 diffusion; consequently, they should be taken into account for the correct interpretation of microthermometric results.