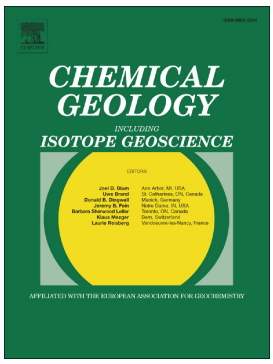

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Gold diffusion into and out of quartz-hosted fluid inclusions during re-equilibration experiments at 600-800 °C and 2 kbar

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Abstract

Fluid inclusions were synthesized in quartz and subsequently re-equilibrated in fluids of different compositions to investigate whether the Au content of fluid inclusions can be modified via Au diffusion through the host quartz. In one experiment fluid inclusions containing 5 wt% KCl were synthesized in platinum capsules at 2 kbar, 800 °C and then re-equilibrated at the same conditions for 4 days in a fluid containing 20.1 wt% NaCl, 3.5 wt% HCl and ~100 ppm Cs enclosed in a gold capsule. LA-ICP-MS analyses of 5-10 fluid inclusions before and after the re-equilibration experiment demonstrate that the inclusions gained up to 570 ppm Au and up to 0.23 wt% Na during the re-equilibration process. Their unchanged high K-content and the absence of Cs within the inclusions proves that they remained physically closed during the re-equilibration, and thus that Na and Au were gained by diffusion through the quartz lattice. In a similar experiment conducted at 600 °C the fluid inclusions gained up to 140 ppm Au within 14 days. Reverse experiments were conducted by synthesizing Au-bearing fluid inclusions in gold capsules and then re-equilibrating them in platinum capsules, which caused the inclusions to lose up to several hundred ppm Au. In both type of experiments Au diffusion appears to have been driven by chemical potential gradients of Au between the fluid inclusions and the external fluid. Additional experiments were performed to test whether Au is able to diffuse into fluid inclusions in response to loss of H^+, or indirectly as

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