Noble metal solubility in CO-CO_2 fluid at magmatic PT

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Platnium Group Elements and Au form close associations in various geologic settings from black shales to deposits in the layered ultra-basic rocks such as the Merensky Reef. One mobilization mechanism of noble metals by fluids or melts is caused by high elevated oxygen fugacity (f_{O_2}) close to the hematite-magnetite equilibrium and complexing with Cl^- and HS^-. Meanwhile petrologic data indicate an f_{O_2} close to quartz-fayalite-magnetite buffer and lower in the aforementioned geological settings. We study reactivity of reduced carbonic fluid of CO-CO_2 composition at 200 MPa, 800-1000°C, and f_{O_2} near FeO-Fe_3O_4 or CCO buffers. At the atmospheric pressure no stable liquid or gaseous carbonyls are known for Pt and Au. Our experiments were performed in IHPV with intrinsic f_{O_2} around 2 log units above the Ni-NiO equilibrium. To keep reducing conditions within Pt capsules during experiments we use dry CO-CO_2 fluid produced by thermal decomposition of $FeCO_3$ or MgC_2O_4. It was found that Pt is well dissolved in this fluid and redeposited from the fluid as sub-micron spirals, rods, and inclusions in the quenched aluminosilicate glassy spheres. Glass traps of the different compositions were used to catch material dissolved in the fluid at the end of experiment. Albite glass traps were closed on the early stage of experiments, silica glass traps remain open for fluid to the end of experiment. Pt concentrations in the traps from different runs range from 2 to 1500 ppm. X-Ray tomography demonstrated that Pt within glass trap forms dispersed microparticles that can be missed with LA-ICP-MS analysis. Au is dissolved in the reduced carbonic fluid as well. Au capsules walls were intensively erroded during experiments and holes formed in <30 min. Au concentrations in sodium-silicate glass traps measured with LA-ICP-MS were highly variable in the range 0.2-100 ppm. Bulk chemical analysis of the welded silica glass trap yields 52 ppm of Au. New experimental data explain association of Au and Pt by their mutual solibility in CO-CO_2 medium.