Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5787

Development of multiple hole gasket technique for diamond anvil cell: Implications for fluid-mineral interaction at high-pressure and high temperature

RUNZE JIANG[1,2], RENBIAO TAO[3], CHUNYUAN LAN[2,4] AND JINXUE DU[1]

[1]China University of Geosciences (Beijing)
[2]Center for High Pressure Science & Technology Advanced Research (HPSTAR)
[3]Center for High Pressure Science & Technology Advanced Research
[4]Peking University

Presenting Author: runze.jiang@hpstar.ac.cn

Most of the diamond anvil cell (DAC) experiments use single hole gaskets to seal sample to high pressure and high temperature condition. Multiple holes can also be drilled on a gasket to compare different samples at same pressure and temperature conditions in DAC experiments. Multiple holes technology has substantial advantages, especially in simulation of fluid-mineral interaction at high pressure in geoscience. However, until now, there are no systematical calibration works on multiple hole gasket technique. In this study, pressure difference between different holes on a gasket in DAC experiments was tested by statistical method with ruby as pressure sensor. Multiple (two, three and four) holes with 100 μm in diameter were drilled on gaskets with different material (iron, rhenium, Iridium) by micro laser machine. A python program has been coded to well locate and drill multiple holes symmetrically on a gasket. The pressure deviations (maximum difference between average and individual value) below 10 GPa between each hole were less than 0.1 GPa in two-hole experiment, 0.3 GPa in three-hole experiment and 0.2 GPa in four-hole experiment, respectively. Our study also shows that the thickness (50 – 80 μm) of preload gaskets and heating processes have limited influence on pressure distribution between multiple holes on a gasket. Finally, we applied four holes technique to compare solubility of calcite in different chemical environment at high pressure and temperature conditions. The preliminary results show that this technique can be widely applied to simulate fluid-mineral interaction at high-pressure and high-temperature in diamond anvil cell.