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### **Formation of Synthetic Petroleum Inclusions in Quartz at Low Temperature**

Synthetic petroleum inclusions trapped under known conditions can be used to study PVTX properties of petroleum and for calibration of analytical instruments. Petroleum inclusions have previously been trapped at low temperature in soft, highly soluble minerals like halite and sylvite, but these are not suitable for PVTX studies because the volume of the inclusion changes during heating to homogenization. Here we describe a technique for forming synthetic petroleum fluid inclusions in quartz at temperatures  $\leq 250^{\circ}\text{C}$ .

The synthetic fluid inclusion technique was used to trap petroleum inclusions under various conditions. Temperature ranged from  $100^{\circ}\text{C}$  to  $250^{\circ}\text{C}$  at 500 to 1000 bars. The experimental duration was weeks to months. Liquid petroleum and aqueous solutions were loaded into platinum capsules along with a pre-fractured quartz core. The aqueous compositions included basic  $\text{SiO}_2$ -saturated solution (1-10 wt% NaOH), neutral  $\text{SiO}_2$ -saturated solution, and synthetic seawater (3.5wt% TDS). Various types of fluid inclusions were trapped during the experiments, including liquid oil inclusions with consistent liquid-vapor ratios. These inclusions are interpreted to have trapped only petroleum, and thus can be used to determine PVTX properties of the oil using data from microthermometric analysis and PVT modeling of the oil.

Our experiments show that oil inclusions can be trapped in quartz at temperatures  $\leq 250^{\circ}\text{C}$ . These results confirm the feasibility of using synthetic petroleum inclusions to calibrate and test techniques for determining compositions of natural fluid inclusions based on microthermometric data and PVT modeling.

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