Cryogenic 2D Raman mapping of NaCl and $CaCl_2$ hydrates in synthetic fluid inclusions

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Point analysis with cryogenic Raman spectroscopy has been used to quantitatively estimate the solute composition of synthetic fluid inclusions. However, uncertainty may be caused by inhomogeneous distribution of hydrates and ice. This study aims to overcome this problem through 2D mapping of hydrates and ice with cryogenic Raman, using synthetic fluid inclusions of known H_2O-NaCl-$CaCl_2$ compositions.

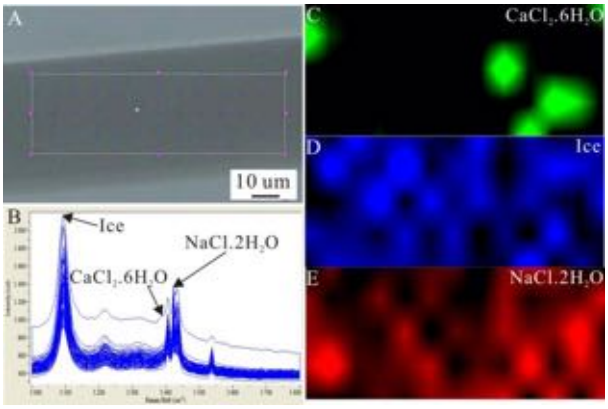

Fig.1 Microscopic image of a capillary containing frozen solution at -185°C (A), Raman spectra (B), distribution of antarcticite (C), ice (D), and hydrohalite (E). NaCl/(NaCl + $CaCl_2$) ratio (molar) = 0.80

Solutions of H_2O-NaCl-$CaCl_2$ compositions were placed in fused silica capillaries and cooled to -185°C (Fig. 1A). Raman spectra were collected, and hydrohalite, antarcticite and ice were recognized using their characteristic peaks (Fig. 1B). Preliminary 2D mapping results indicate that the hydrates and ice are inhomogeneously distributed (Fig. 1C-E). Using the area ratios of the hydrates and ice, the NaCl molar ratio was estimated to be 0.81 which is close to the true value of 0.80.