

### Abnormal chloride enrichment under natural gas hydrate formation

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An in-situ electric circuit was designed for measuring the chloride concentration under high pressure and low temperature condition with reliable accuracy. In a cylindrical high pressure bearing cell, three tubes with holes on their walls and few electrodes were installed around the clay mixture. The holes on the tube walls were incorporated in order to regulate the interface area between methane gas and clay mixture. Abnormal chloride concentration was observed under the fast MH formation rate, but no noticeable concentration change was detected under a relatively low rate of MH formation. We also suggest that MH formation rate must be maintained at least in the order of  $\sim 10 \text{ mol}^2 \text{ m}^2 \text{ yr}^{-1}$  to efficiently enrich chlorides and keep the enriched chloride level. The physical effects of chloride anions on the surface morphologies of methane hydrate formed in the sediments were additionally examined using a Field Emission-Scanning Electronic Microscope (FE-SEM).