Petroleum and aqueous fluid inclusions in Mesozoic and Carboniferous rock salts from Atlantic Canada

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Fluid inclusions are known to exist in rock salts in various forms, phases, and compositions. Fluid Inclusion Assemblages (FIA) represents a group of such inclusions with similar composition which have been trapped at the same time, under approximately the same temperature-pressures; so they represent a "Fluid Event" in the history of the depositional system and they also represent the original fluids available at the site where they were trapped in this material. Rock salt samples of Mesozoic age taken from wells in offshore Nova Scotia and Newfoundland as well as Carboniferous rock salts from the Pugwash salt mine (Cumberland County) were studied for their fluid inclusion contents. They were studied under transmitted and fluorescence microscopes in addition to using the specialized heating-cooling stage. The study showed that they contain many FIA representing both aqueous and petroleum fluid inclusions. Both exist in many forms and phases (liquid, vapour, liquid-vapour, as well as solid (crystals) in some of them). The aqueous inclusions have generally regular shapes (cubes, rectangular parallelepiped, or cylindrical), while the petroleum fluid inclusions are mostly elongate and tubular (single or network-like). Microthermometric studies of these fluid inclusions showed a wide range of homogenization temperatures and also different compositions. These data suggest that different FIA have formed at different times and under various temperature-pressure conditions during the long depositional, burial, and post-burial tectonic history to which the salts were subjected. Abundant fluid inclusions also suggest that the salts allowed the introduction of fluids into their structure; thus under certain burial conditions they became porous-permeable material, in agreement with supporting experimental studies by others suggesting that the salt become porous and permeable to fluids at depths of more than ca. 3 km. The study also shows that colouration of salts is due to either staining material such as iron oxides along cleavage and/or fractures, or due to the existence of various colouring material trapped in fluid inclusions.