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The effect of contained fluids during rocksalt heating: insights from thermal expansion experiments on halite single crystals.

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Rocksalt overall characteristics and peculiarity are well known and have made rocksalt bodies one of the most favorable choice for nuclear waste storage purposes. Low to medium temperature effects related to nuclear waste heat generation have been studied by several authors. However, high temperature related salt behavior has been poorly investigated as well as studies focused on the effect of temperature increase on fluids contained in halite. Here we present the results of thermal expansion experiments in the range 50 – 700°C made on halite single crystals with different fluid contents. Our results show that thermally unaltered halite is subjected, upon heating, to thermal instability around 300 – 450°C, with sudden increase in expansivity, sample cracking and fluids emission. Moreover, thermal expansion results higher for fluid-rich salts. In contrast, thermally altered halite, lacks the instability occurrence, showing a constant linear thermal expansion regardless its fluid contents. Rocksalt thermal instability, that is likely to be due to fluids overpressure development upon heating, lead also to a bulk density reduction. Thus, unaltered salt heated to temperature around 300°C or more could cause damage, fluids emission and density drop, increasing the salt mobility. For this reason, a detailed and quantitative study of fluid type, abundance and arrangement within crystals, as well as their response to stress and thermal changes is fundamental for both scientific and applicative purposes regarding halite.