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Substructure decoration with gamma radiation of rock salt (NaCl) for transmitted light optical microscopy - a review

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Inspired by the possible storage of nuclear waste in impermeable rock salt formations, numerous theoretical and applied studies have investigated the effect of gamma irradiation on the structural properties of halite over the last five decades. An important discovery has been the gamma irradiation - induced decoration of otherwise invisible lattice defect substructures in this optically isotropic mineral (Urai et al, 1986; Donker and Garcia Celma, 1996). This is used to unravel the geologic history of the rock salt. The decoration of defects is caused by the heterogeneous nucleation of colloidal Na at specific conditions of irradiation dose rate, temperature, and total dose (Opbroek and Hartog, 1984). However, although the development of total stored energy is well known as a function of these parameters, the distribution of the colloidal Na as a function of defect structure is not well understood and provides an opportunity to further develop the method. In this review, we present examples of microstructural studies of thin sections in the optical microscope and outline the path towards optimization and standardization of the method. Currently, defect decoration in natural rock salt is being further investigated using the FRM II gamma irradiation facility (Li et al, 2022).

Urai et al., 1986. <https://doi.org/10.1038/324554a0>

Donker and Garcia Celma, 1996. <https://doi.org/10.108/10420159608212929>

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