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重晶石中の SO3-ラジカルのα線による生成効率：ＥＳＲ年代測定への応用
The alpha effectiveness for formation of SO3- in barite : an application to ESR dating

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While Kasuya et al. (1991) first pointed out that ESR (electron spin resonance) dating of barite ($BaSO_4$) is possible, the method was first practically applied by Okumura et al. (2010) to a sample formed by the submarine hydrothermal activity. A subsequent study by Sato et al. (2011) studied the thermal stability of the signal and concluded that the dating signal due to SO_3^- is stable so that dating method is applicable up to at least several thousand years.

Barite crystals formed by submarine hydrothermal activities contains large amount of Ra which replaces Ba in the crystal lattice where all dose rate is due to radiation from Ra. Okumura et al. (2010) reported a concentration of 7.7 Bq/g of Ra in a hydrothermal sulfide including barite where the internal alpha dose rate in barite contributes 40 to 60 % of total dose rate. Determination of alpha effectiveness is thus the one of the essential factors for improving the precision of dating of barite by ESR.

Toyoda et al. (2012) investigated the alpha effectiveness for the ESR signal due to SO_3^- in barite by comparing the dose responses of the signal for gamma irradiation and for He ion implantation with an energy of 4 MeV. A value 0.043 was obtained for a sample from Morocco.

However, the dose response was far from good, where the number of points is not sufficient. The experiments of He ion implantation was repeated in the present study for several samples to determine the precise alpha effectiveness.

As results, a value of 0.0012 was obtained from a sample from Morocco), and 0.00045 from one from Funaoka mine. The results of further repeated analysis will be presented.

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