Decay of E1 Center in Quartz from Nojima Core Sample by the Contace of H2 Gas as a Possible Indicator for H2 Generation

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The changes of ESR signals of quartz by contact with H2 gas were studied. Grains taken from four core samples of the fracture zone of the Nojima fault at the depth of 625 m were exposed to H2 gas
and changes of their ESR signals were studied. Only one out of four samples without etching treatment showed small decrease of the E'1 center while all four samples after etching with HCl
and HF showed large decrease of the E'1 center. The decrease was suggested as substitution of an unpaired electron at the E'1 center by H-. Large decrease of the E'1 center observed for etched samples is explained by the exposure of dislocations and defects caused by fine-graining during
etching. The decrease of the E'1 center might be used as indicator of H2 generation.

ESR signal found in quartz have been studied and applied for dating using their sensitivity of radiation or the survey of heating history.

Some of ESR centers are also sensitive of environmental gas. ESR can be used to investigate molecules adsorbed on materials, or structure induced by chemical reaction with environmental gas.

The amount of degassing has been monitored and anomalously high concentrations of H2 gas are reported. We study the effect of H2 on ESR
signal of intrafault material and to detect trace of H2 that exist underground.

We used core samples taken from the fracture zone of the Nojima fault. The core samples was taken by the Nojima fault drilling by geological survey of Japan (GSJ) at Hirabayashi. The drilling penetrated the fracture zone at the depth of about 625 m and samples taken from this zone were used for the experiment.

Samples were crushed and grains less than 100 micron were selected. Half of the samples were etched by 12N HCl for 1 hour and 10Hf for 30 min. Samples were then exposed to H2 gas for 2 hours and ESR signals were before and after the contact with H2 were compared. For samples with etching treatment, the sample which was located upper side of gouge zone showed small decrease of the E'1 center while other three samples which was located lower side showed no change. For the sample with etching treatment, all four samples showed large decrease of the E'1 center. The decrease was suggested as substitution of an unpaired electron at the E'1 center by H. Large decrease of the E'1 center observed for etched samples is explained by theexposure of dislocations and defects caused by fine-graining during
etching. The decrease of the E'1 center might be used as indicator of H2 generation.

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