

## PULSE RADIOLYSIS OF WATER BY ENERGETIC HEAVY ION

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Water radiolysis is a fundamental process governing radiation effects in various aspects. Degree of water molecule decomposition depends on the type and LET (Linear Energy Transfer) value of radiations. However, the degradation of water molecules by  $\alpha$ -particle has not been clearly understood. In this study, we aimed to clarify the reaction behavior of the groundwater induced by  $\alpha$ -particles from high-level radioactive waste (HLW) in the geological disposal environment.  $\alpha$ -Radiolysis of water was investigated by use of high energy helium ions accelerated by the AVF cyclotron in TIARA facility, JAEA/Takasaki. The pulsed He ion irradiation technique and online time resolved absorbance measurement system was investigated for direct observation of chemical reactions of transient species produced by irradiations [1]. Hydroxyl (OH) radical is the most important species for reactions in aqueous samples because of its high reactivity and formation yield. NaCl was selected as a probe reagent for the OH radical produced by the irradiation with He ion, and dissolved in pure water. Because 50 MeV He ion has the penetration range at 1.5 mm in water, the sample cell has the thickness of 2 mm, and 50  $\mu\text{m}$  glass windows on the top and bottom for preventing energy loss of the incident ions and measuring the absorbance. The transient absorbance was recorded for the aqueous NaCl solutions using semiconductor LASER diode at 375 nm as a probe light source. ClOH $\cdot$  was formed by the reaction of the OH radical with Cl $\cdot$ . The absorbance of ClOH $\cdot$  increased within the irradiation pulse width, and then decreased gradually. The formation yield of ClOH $\cdot$  which was estimated from the peak absorbance value, increased with the solute concentration. Precise analyses of chemical reactions occurred in track will be discussed at the presentation.

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### Reference

- [1] M. Taguchi, et al., *Radiat. Phys. Chem.*, **78**, 1169 (2009)