

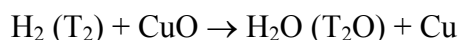
Near-infrared Spectroscopy of Tritiated Water

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It is quite important to control and observe the concentration and total amount of tritium when nuclear fusion is utilised like ITER project. There are many kinds of varieties of molecular species, conditions, amount, and concentration in the environment and it is desirable to have multiple ways of observation. Tritium is often included in hydrogen, water and methane molecules. Their behaviour differs by the molecular species and detection of molecular species is important. Near-infrared spectroscopy is molecular species sensitive method. It is applicable to an in-line measurement system and can accept common glass (e.g. pyrex) as optical windows. However, basic spectroscopic information of tritiated water is unavailable. In this study we prepared tritiated water of high concentration and carried out frequency modulation near-infrared spectroscopy.

For this purpose, a few Torr of tritiated water filling the 1 cm diameter and 1m stainless cell, which is equivalent to about 1 Ci of tritium, was desired. The tritiated water was synthesized through the following reaction.



We carried out a cold run to confirm the experimental condition. The water was captured by the cold trap at -196°C. The reaction above was well proceeded after 30 minute heating of CuO at 300°C. Two Ci of tritium was used for the tritiated water preparation.

Spectrum at 1.3 micron was recorded for narrow frequency region. More than 10 lines that are not listed in the HITRAN 2008 database[1] as spectral lines of H₂O or HDO were found. They are strong candidates of tritiated water spectral lines. We will continue scanning wider region so that full spectral analysis that will prove the molecular species can be carried out.

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Reference

1 HITRAN 2008 database, Journal of Quantitative Spectroscopy and Radiative Transfer, vol. 110, pp. 533-572 (2009).