Separative capture and concentration determination of I_2 and I^- formed by thermal decomposition of $NaIO_3$

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The $NaIO_3$ solid is decomposed into various volatile species at high temperature. In order to analyze the chemical composition and concentration of a sample containing two or more volatile compounds, the separative capture and the concentration measurement should be performed sequentially. For capturing the high temperature decomposition products of $NaIO_3$ under various experimental conditions, a sample capture system with three 2-phase gas scrubbers were prepared as shown in Fig. 1.
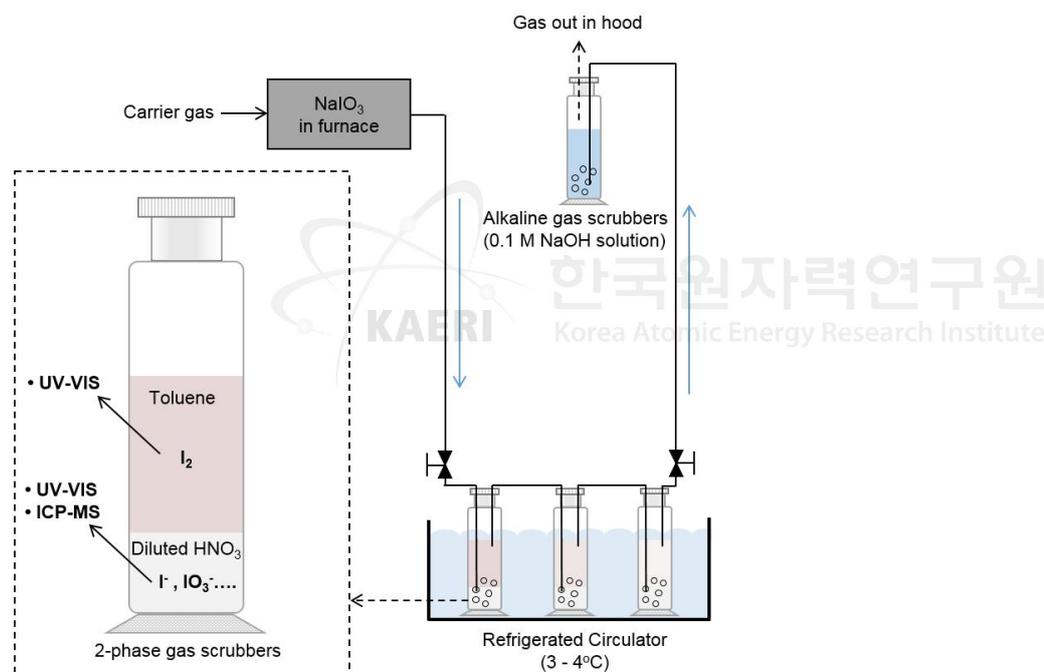

Fig. 1. Schematic diagram of the separative capture system; volatile thermal decomposition products discharged with the carrier gas were captured in 2-phase gas scrubbers installed at the outlet. The capture solutions consist of the organic solvent (toluene) and the acidic aqueous solution (pH 3 HNO_3).

We separately captured I_2 and I^- from the decomposition of $NaIO_3$ by using 2-phase gas scrubbers. And then, we measured the concentrations of I_2 and I^- by using absorption intensities at 498 and 228 nm of ultraviolet-visible (UV-VIS) absorption spectra. The absorption of I^- was partially interfered with that of toluene solved in d-HNO_3, so the absorption spectra of I^- were corrected by those of the toluene blank solutions as shown in Fig. 2. To ensure the accuracy of the analysis, we additionally measured the I^- concentration by using the inductively coupled plasma - mass spectrometer (ICP-MS).
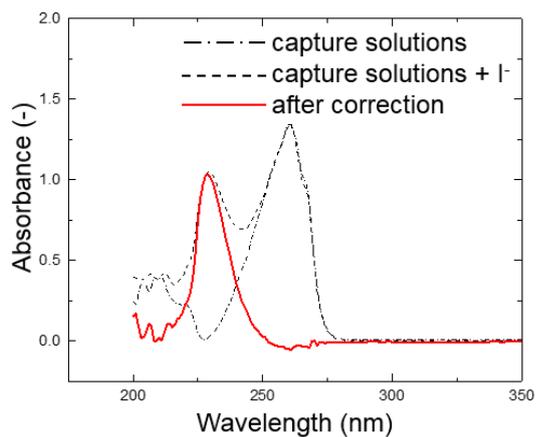
Fig. 2. Corrected absorption spectra of the capture solution.