

Real-Time Observation of Concentration Distribution for Mix Liquids including Water in Micro Fluid Channel with Near-Infrared Spectroscopic Imaging Method

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Abstract : In order to quantitatively comprehend thermal flow for some industrial applications such as nuclear and chemical reactors, detailed measurements for temperature and abundance (concentration) of materials at high temporal and spatial resolution are required. Additionally, rigorous evaluation of the size effect is also important for practical realization. This paper introduces a real-time spectroscopic imaging method in micro scale field, which visualizes temperature and concentration distribution of a liquid or mix liquids with near-infrared (NIR) wavelength region. This imaging principle is based on absorption of pre-selected narrow band from absorption spectrum peak or its dependence property of target liquid in NIR region. For example, water has a positive temperature sensitivity in the wavelength at 1905 nm, therefore the temperature of water can be measured using the wavelength band. In the experiment, the real-time imaging observation of concentration distribution in micro channel was demonstrated to investigate the applicability of micro-scale diffusion coefficient and temperature measurement technique using this proposed method. The effect of thermal diffusion and binary mutual diffusion was evaluated with the time-series visualizations of concentration distribution.

Keywords : near-infrared spectroscopic imaging, micro fluid channel, concentration distribution, diffusion phenomenon

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