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Cuvette's effect correction for practical light-scattering experiment

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Light scattering is a non-invasive technique to characterize small particles, such as microorganism and powder etc. Therefore, it is wildly used in many fields, for instance, pharmaceutical technology and microorganism detection. There are many authors theoretically calculate the scattered light from a particle for fitting to the experimental measurement to determine the particle characteristics. However in practical experiment, scattering particles are usually contained in a cuvette, therefore the detected scattered-light does not come from only a single particle as the theory but combination of the scattered light from each particle contained in the cuvette. Moreover, the refraction and transmission effects cause the deviation of the experimental scattered light from the theory. Consequently, a correction method for applying the scattering theory to the practical has been developed in this research. It combined Fresnel refraction and transmission theories with Snell's law to correct the effects from the cuvette and integration method to correct the effect of particle collection. The scattering theory with correction was validated using 1.1 μm and 3.0 μm in size polystyrene latex beads suspended in de-ionized water (LB11 and LB30, respectively). The measurement results showed good agreements between the scattered light measured from the experiment and the scattered light calculated from the scattering theory with correction. The correlation between scattered light from the experimental measurement and the scattering theory with correction was 0.996 whereas the scattering theory without correction was 0.894 for LB11. In case of LB30, the correlation between the experiment and the theory with and without correction were 0.979 and 0.685, respectively. These fitting results of scattered intensities from experiment and the scattering theory with and without correction showed that the presented correction methods by Fresnel refraction and transmission and Snell's law and integration method were effective to correct the factor caused by the combination of particles and the cuvettes surface in the scattering set up.

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