

Light scattering tool to typify sub-micron particles in relevance to biomedical science

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Light scattering by small particles is one of the most prevailing and non-invasive tools for examining the properties of particulate systems. It has several applications in particle characterization and remote sensing of micron and sub-micron particles in the form of aerosols, interplanetary dust, nanoparticles, bacteria, biological cells etc. Experimental light scattering technique alone may not be sufficient to provide complete information about scattering properties of some sub-micron particles especially particles of biological origin. This calls for need to make use of theoretical approach and computer simulation based on the established theories as an additional tool for typifying such particles. The sub-micron particles including the bio-particles were so chosen because of their importance in biology and biomedical sciences. Light scattering investigation from homogenous sub-micron particles and bio-particles, both pathogenic and non-pathogenic types were carried out at different wavelength of incident light, by using an original designed and fabricated polar and azimuth-dependent light scattering setup. The most favourable cell density or concentration to which single scattering regime could be considered was found out before carrying out experimental investigation of such particles. Simulations of light scattering of these particles were also carried out using a novel Monte- Carlo simulation technique. The closeness of agreement or disagreement between experimental, theoretical and simulated result will be discussed in this paper. Our work is dedicated towards discussions mainly on the divergence found between the experimental and theoretical result, which provides a better insight into particle characterization. Furthermore, the results directs towards importance of inclusion of azimuthal dependency in conducting light scattering experiment.

References

- [1] Roy, S., Barua, N., Buragohain, A. K., and Ahmed, G. A., 2013: Study of ZnO nanoparticles: antibacterial property and light depolarization property using light scattering tool. *J. Quant. Spectrosc. Radiat. Transfer* **118**, 8–13.
- [2] Xu, M., and Katz A., 2008: Statistical interpretation of light anomalous diffraction by small particles and its applications in bio-agent detection and monitoring. *Light Scattering Rev.* **3**, 27– 67.
- [3] Mishchenko, M. I., Hovenier, J. W., and Travis, L. D. (eds.), 1999: *Light Scattering by Nonspherical Particles: Theory, Measurements, and Applications*. Academic Press, San Diego.

Preferred mode of presentation: Oral