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Size Estimation of Suspended Nanoparticles Produced by Liquid-Phase Pulsed Laser Ablation using Multi Angle Near-Infrared Light Scattering Transmissometry and Nephelometry

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It is admitted that Liquid-Phase Pulsed Laser Ablation (LP-PLA) attracts more and more much attention and has been presented as an effective and innovative method of synthesis of functional nanoparticle materials. In our previous study, we have shown that the concentration of produced nanoparticles is linear with time, meaning that the production of nanoparticles by Pulse Laser Ablation is a controllable and precise process. This paper completes the first study by carrying a particular attention on average size estimation of the generated nanoparticles. The study is based on the use of a simple Multi Angle Near-Infrared Light Scattering (MA N-IR LS) device, which in real time, estimates easily by transmissometry and dual angles nephelometry, the average size of copper and iron nanoparticles produced by LP-PLA process. The developed experimental setup, mounted on a simple electronic's instrumentation board and a specialized software has shown that the method can be easily used to estimate size evolution of produced nanoparticles; justified by the fact that our experimental curves can be correlated to the size of Cu and Fe nanoparticles, present in the aqueous medium. The software implements Beer-Lambert law and Rayleigh theory at two different angles which, after the nanoparticles concentration calculation, evaluates their average size, based on exploitation of the reverse equations correlated to the concentration after multi-angle observations. With our integrated device, only three angles of light scattering theories are sufficient to evaluate judiciously the global size of the nanoparticles generated during a Femto-Second Laser Ablation process. The users would just have to correctly install our device in the laser ablation process plan.

Keywords: Liquid-Phase Pulsed Laser Ablation, Nanoparticle size estimation, Colloidal particle, Near-Infrared Light Scattering, Transmissometry, Nephelometry.

Biography

Tchami Jean Hilaire did his Ph.D. in Process Engineering, Option: Automation, Command, Equipment and Modelling. University of Ngaoundéré, Cameroun. He is working as a Junior Lecturer in National Advanced School of Agro-Industrial Sciences (ENSAI), teaching courses: Instrumentation and sensors, Regulation, Automation, Computer Science for Engineering, Electronic, Electrotechnology, Microprocessor and instrumentation technologies and Practical works in electrical engineering. He has published 2 papers in international journals and attended 2 international Conferences. He is a Member of the Cameroon Physical Society. He got first prize in the 2016 edition of Cameroon National Technology and Innovation Days and also he received first prize in Science and Technologies of the 2017 edition of the Cameroon University Games, Bamenda. He is an African Semi- Finalist of the 2018 APSA Innovation Challenges for Science and Technology, Technologies and Innovations for Sustainable Development. Addis Ababa, Ethiopia and trainer of many students and projects in electrical engineering applied for process plan.