

Pulsed laser ablation in liquids: formation of colloidal nanoparticle solutions

Rafaela Radičić

Supervisor: doc.dr.sc. Nikša Krstulović

Plasma and Laser Applied Research Group, Centre for Advanced Laser Techniques, Institute of Physics, Zagreb

Abstract

In nanoscience and nanotechnology, nanoparticles have a significant role due to their unique magnetic, electrical, mechanical, optical, and electronic properties with respect to the bulk materials [1]. Pulsed laser ablation in liquid (PLAL) gained a lot of attention due to the simplicity, effectiveness, high purity, and fast production of nanoparticles [2], where a wide range of parameters can be optimized [3]. In the PLAL technique, a pulsed laser beam ablates a metal plate immersed in a liquid where plasma is formed. There is an energy exchange from the plasma to the liquid, where a cavitation bubble forms. Eventually, particles are released from the cavitation bubble into the surrounding liquid [4]. Furthermore, there is no limit on the type of produced nanoparticles because every metal target can be ablated.

In this seminar, principles of the laser ablation in liquids will be explained, from plasma generation to nanoparticle production. Factors affecting the synthesis of nanoparticles, such as laser pulse parameters and the liquid medium, will also be addressed.

Keywords: pulsed laser ablation, nanoparticles, colloidal solutions, laser parameters

[1] C. Huang, X. Chen, Z. Xue, T. Wang, *Sci Adv.* **6** (2020), 1321.

[2] R. Streubel, S. Barcikowski, B. Gökce, *Opt. Lett.* **41** (2016) 1486-1489.

[3] H. Naser, M.A. Alghoul, M.K. Hossain *et al.*, *J Nanopart Res.* **21** (2019) 249.

[4] S. I. Kudryashov, A. A. Samokhvalov, A. A. Nastulyavichus, *Mater.* **12** (2019) 562.