Taylor-Aris dispersion Analysis to characterise Plasmonic Nanoparticles

Patricia Taladriz-Blanco[1]
Sandor Balog,[1] Liliane Ackermann,[1] Dimitri Vanhecke,[1] Barbara Rothen-Rutishauser [1]and Alke Petri-Fink[1,2]

[1] Adolphe Merkle Institute, University of Fribourg, Chemin des Verdiers 4, CH-1700 Fribourg, Switzerland.
[2] Chemistry Department, University of Fribourg, Chemin du Musée 9, CH-1700 Fribourg, Switzerland.

patricia.taladrizblanco@unifr.ch

The wide range of nanoparticles of different composition, size, and shape developed on demand requires a full and reliable characterization of their physicochemical properties.[1] In this context, UV-Vis spectroscopy, light scattering, and electron microscopy are the most commonly used techniques. However, each technique has its inherent limitations and strengths. In this regard, it is necessary to develop new techniques that either overcome the limitations of the existing techniques or can be used in combination with them to verify the obtained results. Taylor-Aris dispersion analysis (TDA) is an absolute technique initially developed to determine the apparent size of proteins and polymeric particles.[2] Recently, it has been demonstrated that silica nanoparticles and superparamagnetic particles can be successfully characterized by TDA.[3][4] Relying on the fact that detection by TDA is based on absorption, herein we demonstrate that the size of spherical and anisotropic metallic nanoparticles can be determined by TDA. In order to prove the versatility of the technique, we also analyzed gold-silver mixtures. Results were compared with data obtained by polarized and depolarized light scattering (DLS and DDLS) and transmission electron microscopy (TEM).

References

[1] S. Mourdikoudis, R. M. Pallares, N. T. K. Thanh, *Nanoscale* **2018**, *10*, 12871.
[2] A. Hawe, W. L. Hulse, W. Jiskoot, R. T. Forbes, *Pharm. Res.* **2011**, *28*, 2302.
[3] D. A. Urban, A. M. Milosevic, D. Bossert, F. Crippa, T. L. Moore, C. Geers, S. Balog, B. Rothen-Rutishauser, A. Petri-Fink, *Colloid Interface Sci. Commun.* **2018**, *22*, 29.
[4] U. Pyell, A. H. Jalil, D. A. Urban, C. Pfeiffer, B. Pelaz, W. J. Parak, *J. Colloid Interface Sci.* **2015**, *457*, 131.