Combination of Low Angle Elastic Light Scattering (LAELS) and Multi-Wavelength Turbidimetry (MWT) for the analysis of biopolymers filamentous networks

Fabio Ferri[1*], G. Re Calegari[1], M. Molteni[1], M. Rocco[2]

[1]*Dipartimento di Scienza e Alta Tecnologia, Università dell'Insubria, Via Valleggio 11, I-22100 Como, Italy.*

[2]*Biopolimeri e Proteomica, IRCCS AOU San Martino-IST, Istituto Nazionale per la Ricerca sul Cancro, c/o CBA, Largo R. Benzi 10, I-16132 Genova, Italy.*

[*]*fabio.ferri@uninsubria.it*

Biopolymer filamentous networks are ubiquitous and important structural elements in the living world, such as the cell cytoskeleton, the extracellular matrix, and the blood coagulation system. Low Angle Elastic Light Scattering (LAELS) and Multi-Wavelength Turbidimetry (MWT) are convenient optical techniques for studying these systems in situ and real time, but they might be fairly inaccurate when used independently. We present a novel approach [1] based on the combination of these two techniques, in which the sample is simultaneously studied with LAELS and MTWS. By globally fitting the LAELS data with a proper form factor and the MWT data with a function obtained by angularly integrating the scattering form factor, all the parameters characterizing the gel (pore size, fiber diameter and density, network fractal dimension) can be independently recovered. Numerical simulations were employed to validate the reliability and accuracy of the method, which is then applied to evolving fibrin gels data. More in general, this method is extendible to the analysis of other filamentous networks that can be represented as ensembles of cylindrical elements.

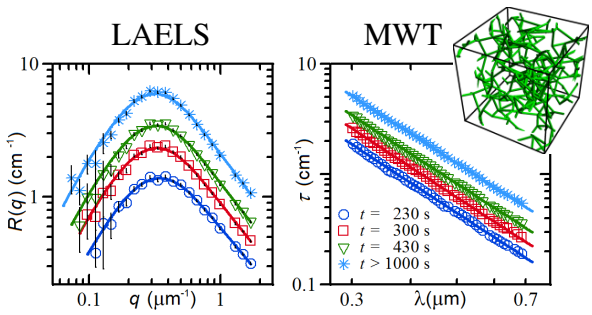

Figure 1 Left: Low Angle Elastic Light Scattering (LAELS) technique. Right: Multi-Wavelength Turbidimetry (MWT) technique; inset: sketch of a fibrin gel.

[1] F. Ferri, G. Re Calegari, M. Molteni, D. Magatti, B. Cardinali and M. Rocco, *Macromolecules*, 2015, **48**, 5423.