Conference

Wide Angle and Small Angle X-ray Scattering for the structural characterization of fibers.

Teresa Sibillano,[a,*] Alberta Terzi,[a] Liberato De Caro,[a] Francesco Scattarella,[a] Rocco Lassandro,[a] Cinzia Giannini.[a]

Over the years, there has been a growing interest in the development of nanofibrous structures with natural (collagen, silk fibroin, elastin, chitosan, alginate) and synthetic (polylactic acid - PLA, poly-lactic-co-glycolic acid – PLGA, polycaprolactone – PCL) polymers as fibrous structures. Thanks to tunable specific features linked to their nanostructure, the application of nanofibers in several fields has shown to be suitable for the solution of practical problems. Wide-Angle (WAXS) and Small-Angle (SAXS) X-ray Scattering are two techniques available at the MicroImaging Laboratory (XMI-Lab) of the Institute of Crystallography in Bari[1] equipped with by a table top high brilliance (synchrotron class) X-ray micro-source. Here, we report our work on natural polymeric fibers such as type I collagen[2,3], silk fibroin from Bombix Mori, cellulose[4] but also on engineered fibers, such as peptide-based supramolecular architectures.[5]

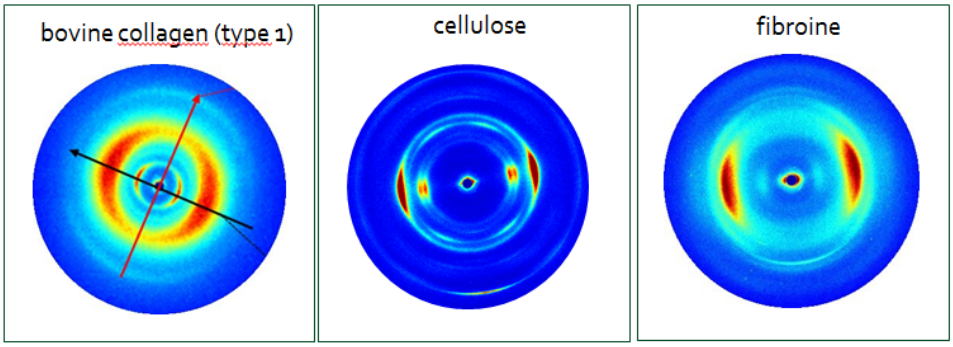

Fig. 1 Wide-Angle X-ray Scattering (WAXS) patterns measured on natural fibers.

References

1 D. Altamura, R. Lassandro, F. Vittoria, L. De Caro, D. Siliqi, M. Ladisa, C. Giannini, X-ray microimaging laboratory (xmi-lab), Journal of Applied Crystallography 45 (4) (2012) 869–873. doi:10.1107/S0021889812025733.

2 A. Terzi, E. Storelli, S. Bettini, T. Sibillano, D. Altamura, L. Salvatore, M. Madaghiele, A. Romano, D. Siliqi, M. Ladisa, et al., Effects of processing on structural, mechanical and biological properties of collagen-based substrates for regenerative medicine, Scientific reports 8 (1) (2018) 1–13. doi:10.1038/s41598-018-19786-0.

3 A. Terzi, N. Gallo, S. Bettini, T. Sibillano, D. Altamura, L. Campa, M. L. Natali, L. Salvatore, M. Madaghiele, L. De Caro, L. Valli, A. Sannino, C. Giannini, Investigations of processing–induced structural changes in horse type-i collagen at sub and supramolecular levels, Frontiers in bioengineering and biotechnology 7 (2019) 203. doi:10.3389/fbioe.2019.00203.

4 L. De Caro, C. Giannini, R. Lassandro, F. Scattarella, T. Sibillano, E. Matricciani, G. Fanti, X-ray dating of ancient linen fabrics, Heritage 2 (4) (2019) 2763–2783. doi:10.3390/heritage2040171.

5 C. Diaferia, N. Balasco, T. Sibillano, M. Ghosh, L. Adler-Abramovich, C. Giannini, L. Vitagliano, G. Morelli, A. Accardo, Amyloid-like fibrillary morphology originated by tyrosine-containing aromatic hexapeptides, Chemistry–A European Journal 24 (26) (2018) 6804–6817. doi:10.1002/chem.201800351.

[a] *CNR - Istituto di Cristallografia, via Amendola 122/O, 70126 Bari, Italy*

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