

Chiral assemblies along cellulose nanocrystals

Olli Ikkala¹

¹Aalto University, Department of Applied Physics and Centre of Excellence in Molecular Engineering of Biosynthetic Hybrid Materials Research, P.O. Box 15100, FIN-00076 Aalto, Espoo, Finland

Cellulose nanocrystals (CNC) have already long recognized to allow left-handed cholesteric liquid crystallinity due to the slight right-handed chiral twisting along the individual CNC rods. To directly visualize the latter, we applied high resolution transmission electron tomography [1]. Challenges were encountered due to the required resolution. To promote radiation tolerance, the individualized CNCs were next ionically complexed with cationized Au-nanoparticles [2]. This lead lateral aggregation of a few CNCs, right-handed CD-signal, and chiral plasmonics. Towards next templating tunable helical structures, CNCs were first decorated with anionic polymer brushes, and complexed with double hydrophilic diblock copolymer with a cationic block undergoing interpolyelectrolytic complexation with the anionic brush. Depending on the polymer lengths, CNCs with helically twisting surface topographies were observed [3].

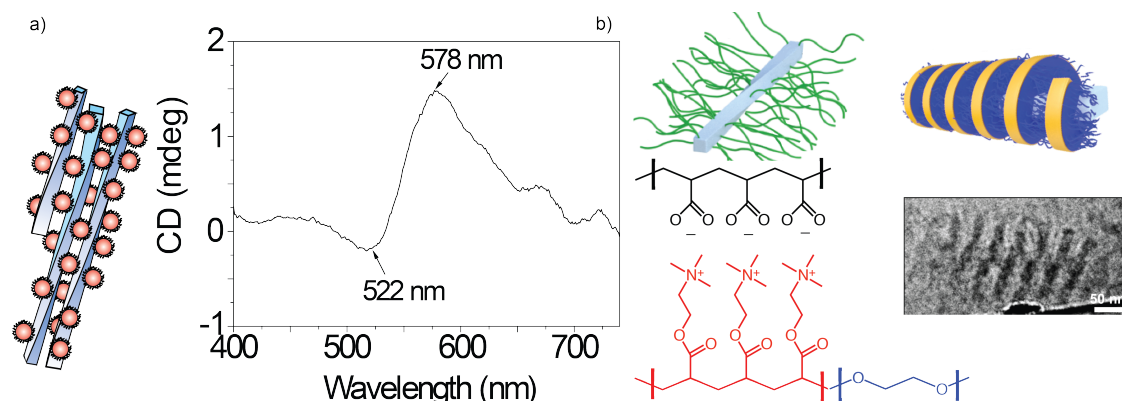


Figure. a) Right handed chiral plasmonics using CNCs with ionically complexed cationic Au nanoparticles, b) Helically twisting surface structures along CNCs upon ionic complexation of diblock copolymer on oppositely charged surface brushes around CNCs.

References

- [1] J. Majoinen, J. Haataja, D. Appelhans, A. Lederer, A. Olszewska, J. Seitsonen, V. Aseyev, E. Kontturi, H. Rosilo, M. Österberg, N. Houbenov, O. Ikkala, *J. Am. Chem. Soc.*, 136(3), pp. 866–869 (2014).
- [2] J. Majoinen, J. Hassinen, J. S. Haataja, H. T. Rekola, E. Kontturi, M. A. Kostianen, R. H. A. Ras, P. Törmä, O. Ikkala, *Adv. Mater.*, 28(26), pp. 5262–5267 (2016).
- [3] J.-M. Malho, M. Morits, T. I. Löbbling, Nonappa, J. Majoinen, F. H. Schacher, O. Ikkala, A. G. Gröschel, *ACS Macro Letters*, 5(10) pp. 1185–1190 (2016).