BIOSELF

Bioinspired self-assembled mixed gels and helicoidal nanocomposites

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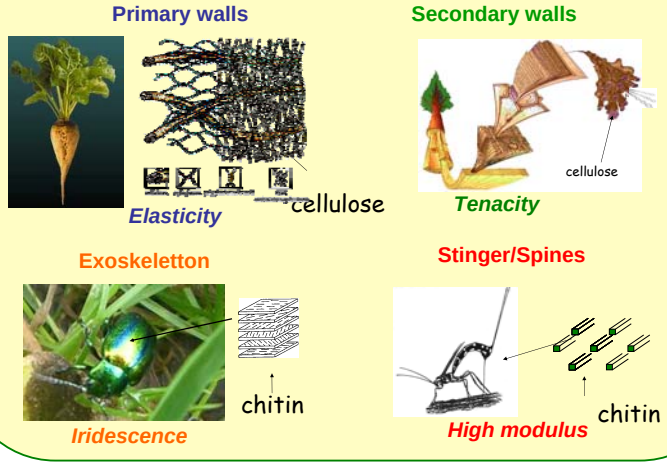
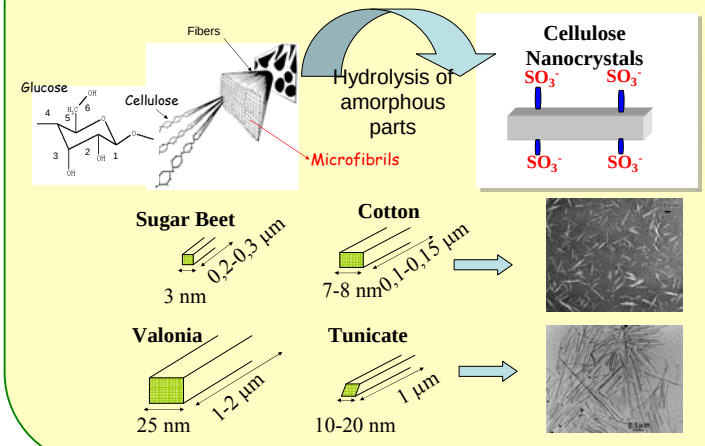
We propose to use natural structures as an inspiring source for the design of innovative nanomaterials. Living organisms elaborate at low energy costs these hierarchical structures with complex self-organisation that can be reproduced with natural and renewable elementary bricks.

The goal of the project is the elaboration of man-made biomimetic materials within a bottom-up approach and their multi-scale characterization. The targeted properties are inspired by their natural analogue: highly deformable mixed gels with osmotic pressure resistance and permeability properties, and nanocomposites with adjustable mechanical or photonic properties.

The biological context

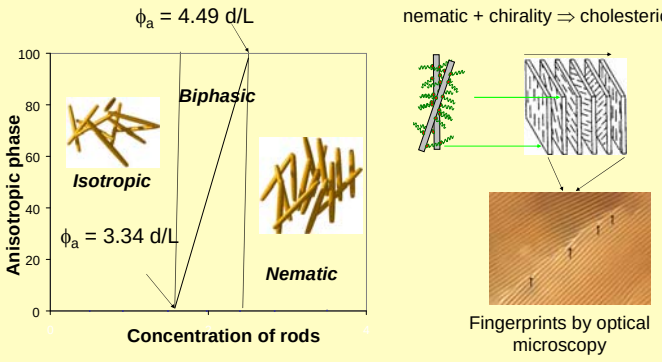


Cellulose Whiskers / Nanocrystals

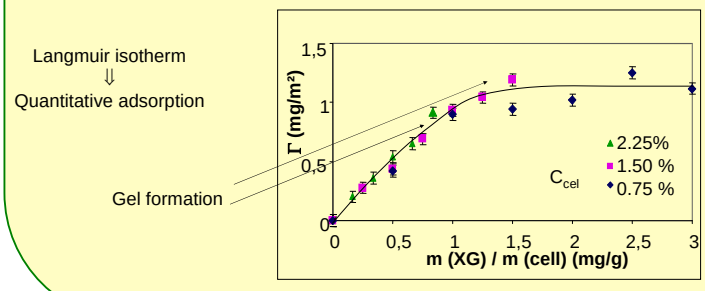


Self-organization

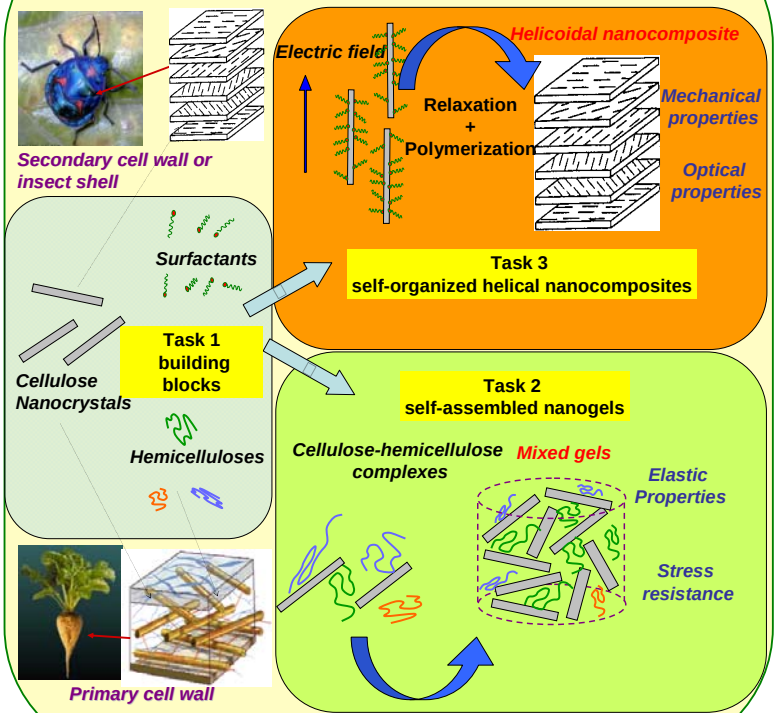
With surfactant in organic solvent



With hemicelluloses in aqueous supension



Biomimetic approach



References

S. Elazzouzi Hafraoui, Y. Nishiyama*, J.L. Putaux, L. Heux, F. Dubreuil & C. Rochas, *The shape and size distribution of cellulose nanocrystals*, ***Biomacromolecules* 9**, 57-65 (2008))

B. Jean*, L. Heux, F. Dubreuil, G. Chambat & F. Cousin, *Non-electrostatic building of biomimetic cellulose-xyloglucan multilayers*, ***Langmuir***, **25**(7), 3920-3923 (2009)

S.Elazzouzi-Hafraoui, J.-L. Putaux, L. Heux*, *Self-assembling and Chiral Nematic Properties of Organophilic Cellulose Nanocrystals* ***J. Phys. Chem.***, 113, 11069–11075 (2009)

S. Berlioz, S. Molina-Boisseau, Y. Nishiyama, L. Heux*, *Gas-Phase Surface Esterification of Cellulose Microfibrils and Whiskers* ***Biomacromolecules*, *10***, 2144-2151(2009)