Associative properties of rapeseed napin and pectin: a solid-to-liquid transition during complex coacervation.

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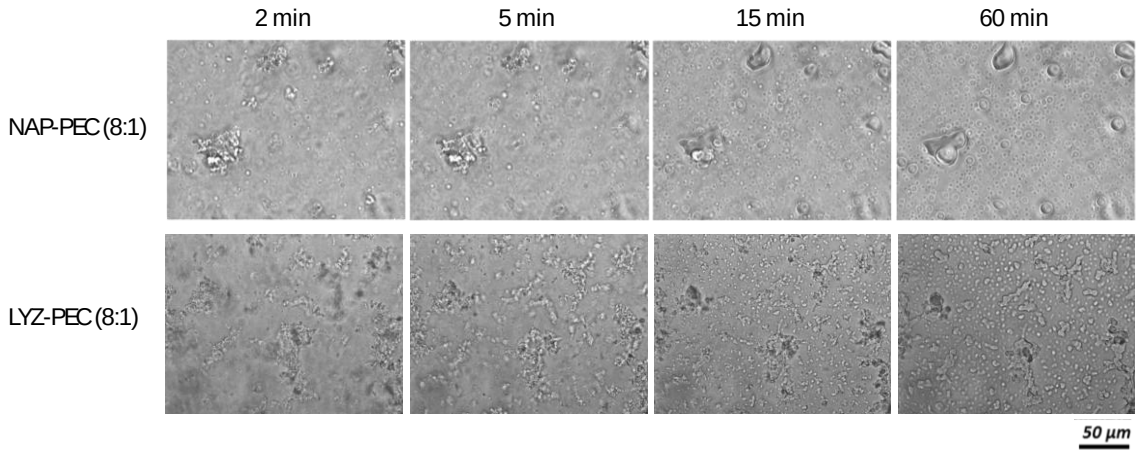
Using a droplets-based millifluidic device [1], we successfully map, through turbidity measurements, the phase behavior of a plant protein, rapeseed napin (NAP), mixed with a plant polysaccharide, pectin (PEC). The optimum pH for NAP-PEC interactions was found at pH 4, corresponding to the highest electrostatic contribution between the two biopolymers. Additional optical microscopy performed at pH 4 highlighted a solid-to-liquid phase transition overtime. We showed that charge neutralization is a requisite for the transition as no rearrangement was observed when residual charges remain. In addition, this transition was found to be temperature-dependent suggesting that secondary interactions, such as hydrogen bonds, may play a role in this phenomenon. To the best of our knowledge, such solid-to-liquid transition has never been reported for protein-polysaccharide mixtures. We question the role of protein flexibility in this phenomenon as NAP is predicted to be partially disordered. To test this hypothesis, we used lysozyme (LYZ) which is similar to NAP in terms of size, molecular weight and charge density but more rigid. We showed that kinetics of rearrangement were slowed down in the case of LYS. The polysaccharide rigidity (i.e. persistence length) could also influence time and temperature-dependence of the solid-to-liquid transition even though it was not investigated here.



[1] C. Amine, A. Boire, J. Davy, M. Marquis and D. Renard, Droplets-based millifluidic for the rapid determination of biopolymers phase diagrams, Food Hydrocolloids **70**, 234 (2017)