Preparation of Protein Materials Through a Combination of Mechanochemistry and Self-Assembly

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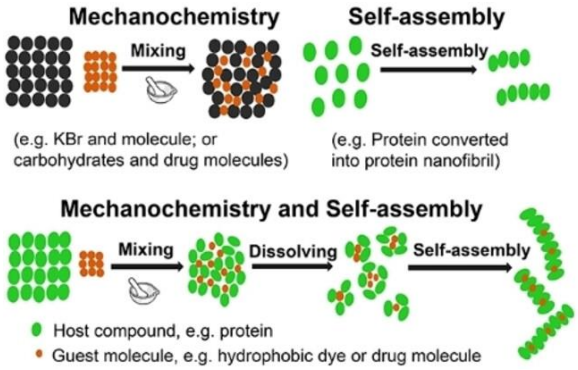
Mechanochemistry offers interesting possibilities for both developing greener versions of established synthetic process as well as novel reactions and processes not feasible in solution phase.[1] In addition, supramolecular mechanochemistry allows for formation of novel hybrid materials. We have developed methodology where mechanochemistry (milling of powders) is combined with aqueous self-assembly of proteins.[2] A water soluble protein capable of self-assembly is milled with a hydrophobic organic compound. The resulting mixture is then dispersed in water and the protein exposed to conditions promoting self-assembly into so-called protein nanofibrils (PNFs).[3] Due to the hydrophobic effect the hydrophobic molecules will stay associated with the protein. In this manner novel protein materials can be prepared where the hydrophobic organic compound (e.g. a drug molecule or a luminescent organic dye) will lend novel functionality to the protein material. In addition, the presence of hydrophobic molecules may influence the self-assembly of proteins and PNFs. Many important dyes, nutrients or drugs are hydrophobic meaning that a wide range of functional protein materials can be prepared. In this presentation examples will be given of the preparative methodology followed by examples of how the resulting protein materials can be processed into macroscopic structures such as gels or bioplastics.



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