Poster Presentation

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Porous peptide frameworks generated by stacking non-self-complementary β-sheets

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One of major approaches in the design of cavity space in the solids utilizes non-self-complementary molecules[1]. The irregular shape of the molecules and/or specific directionality of potential H-bonds prevent close packing of the molecules and yields various architectures hosting a second component, from inclusion compounds and co-crystals to complex non-crystalline patterns in biology. The strategy of non-self-complementary molecules has been extended in our studies to 2D supramolecular polymers based on short peptides[2]. The formation of the peptide layer with a desired overall geometry is controlled by strong, charge-assisted H-bonds (arrows in the Figure) in a β-sheet-like network as well as the segregation of hydrophobic amino acid residues into the interlayer space. The H-bonds add stability to the whole architecture while the hydrophobic groups keep the stacking layers at a distance that generates a cavity space available to a second component (encircled "G" in the Figure). A wide range of inclusions and co-crystals have been prepared in our group based on a series of dipeptides and higher peptide oligomers. For example, the incorporation of various organic solvents and bioactive molecules have been demonstrated for leucyl-alanine and similar dipeptides: alcohols, amides, phenols, pyridines, polyols, vitamins, scents and flavors. The crystal structure studies reveal a surprisingly persistent structural motif that can be used for engineering of crystalline materials with a specific property. We believe this type of peptide matrix may be utilized in the solid state organic synthesis [3] as reactive molecules of the second component can be oriented in a predictable way with respect to each other.

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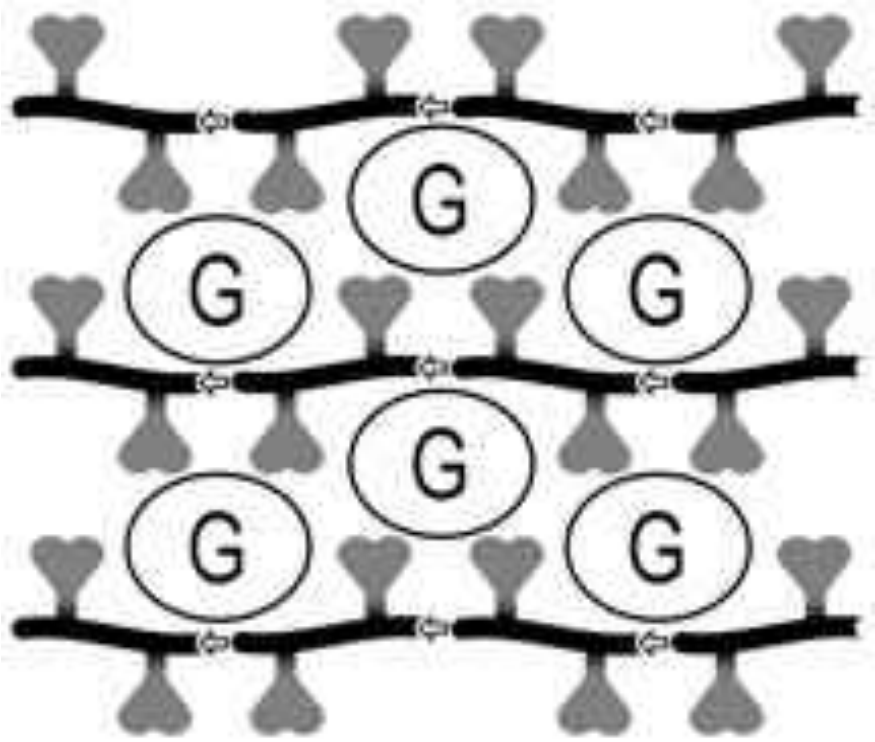

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