# Self-Assembly of Hepta-Peptides on Surfaces of Two-Dimensional Materials

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Two-dimensional (2D) materials have excellent electrical, optical properties and atomically-flat surfaces [1,2]. These unique properties make 2D materials a good candidate as a platform for immobilizing various biomolecules such as DNA or other biomolecules towards applications for bio-imaging or biosensing [3,4]. Among those biomolecules, peptides can provide good approaches for surface functionalization of 2D materials since they have been demonstrated to form ordered uniform monolayer-thick structures on top of 2D materials [5,6] and these ordered structures can be utilized to immobilize biomolecular probes [7,8]. However, the stability of peptide scaffold structure on the surface is still a vital issue that restricts their further application in biosensing.

In this work, we propose a series of heptapeptides with designed $\beta$-sheet-forming structures [9]. Those heptapeptides have alternating non-polar and polar residue which can create an amphiphilic $\beta$-sheet structure that further form stable extended $\beta$-structures via hydrophobic interactions. The non-polar residues are utilized to drive assembly performance, while the polar residues are retained for further capability of supporting biomolecular binding and functionalization. Those heptapeptide formed long range ordered nanowire structure on the surface of graphite as showed in Fig.1. The self-assembled structure on graphite surface were confirmed to be stable under a large range of peptide concentrations. Also, surface coverage ratio of those heptapeptide was quite high. Furthermore, we showed the scaffold stability under water rinsing. With this model heptapeptide, we demonstrated the potential ability of the self-assembly peptide as a molecular scaffold for various functionalized applications.

**Reference:**

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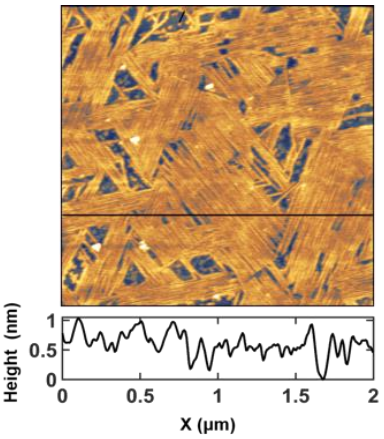


Figure 1. AFM image with height profile showing assembled structure of heptapeptide on graphite surface.