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FTIR detection of different phases of fatty acids forming 3D-assemblies

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Self-assembly of molecules on highly oriented pyrolytic graphite (HOPG) to form ordered patterns have been an area of active research since it is relevant to colloidal stabilization, patterning and thin film devices. Most of the works have focused on 2D crystalline layers of the molecules absorbed onto graphite surfaces. However, more and more research has provided the significance of forming 3D-structures onto surfaces, for instance, superhydrophobicity, self-cleaning and bactericides are induced by 3D wax crystals present on natural surfaces such as plant leaves and insect wings. Two fatty acids, palmitic acid and stearic acid, which are ubiquitous in many organisms, have been found to be the main contributors in the forming of 3D structure of Hemianax papuensis dragonfly wings. Therefore, understanding and mimicking the formation of 3D-patterns in this case is not only important to biological process but also to potential applications. In this work, the two fatty acids were self-assembled onto the surface of HOPG which produced ordered 3D-assemblies. However, despite their similarities in chemical properties, their 3D structure appeared greatly different. Palmitic acid formed into 3D-microblades whilst stearic acids formed into shorter plates. In order to understand the mechanism of such variations, Synchrotron FTIR in ATR mode was employed. Peak shifts in CH2 νas peaks were observed between the two fatty acids. It is postulated that this might be due to different phases present within the same 3D-assemblies of the two fatty acids.

Keywords or phrases (comma separated)

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Summary

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