Kinetic and Mechanical Properties of Interfacial Self-organized Film formed by Class II Hydrophobins

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Hydrophobins are a class of amphiphilic proteins with a high potential for making new kind of vesicles useful in e.g. drug delivery. Contrary to lipid vesicles, they can be formed with either hydrophobic or hydrophilic shell [1]. Hydrophobins form self-organizing films at the interface between an aqueous and any hydrophobic phase. The adsorption kinetics of class II hydrophobins HFBI and HFBII were studied by ellipsometry measurements. These reveal unusual linear kinetics. Attaching bulky side groups, via biomolecular engineering, restore usual Langmuir kinetics [2]. Since conformational changes, due to the high stability, can be neglected, only diffusion and their interactions should determine their kinetics. To confirm this, we introduced a stochastic model which includes microscopic diffusion and electrostatic, van der Waals and orienational interactions between proteins. We show that the kinetics of the system are determined by two factors: the diffusive motion close to the interface and the supply rate of this area [2]. Additionally, we studied the expansion of the film by simulation. We repeated the process of increasing the area followed by a relaxation process. Atomic force microscopy measurements demonstrated a honeycomb structure for the self-assembled film [3]. We guarantee that an orientational energy function must be considered to keep this structure.

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[3] Yamasaki et.al, Flattened-Top Domical Water Drops Formed through Self-Organization of Hydrophobin Membranes: A Structural and Mechanistic Study Using Atomic Force Microscopy. ACS Nano, (2016).