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Functionalization of glass surfaces with SAMs: the effect of synthesis conditions and the application to pharmaceutical crystallization

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Surfaces can alter the outcome of crystallization processes occurring via heterogenous nucleation. In a pharmaceutical scenario, the promotion of specific polymorphs or crystalline habits, as well as the alteration of nucleation kinetics, are compelling issues. Surfaces with controlled physico-chemical features represent a valuable tool for the study of drug crystallization by heterogeneous nucleation. For this purpose, the functionalization of glass with Self-Assembled Monolayers (SAMs) via silane chemistry was investigated. SAMs carrying thiol, amino, glycidyloxy and methacrylate end-groups will be presented. Different sets of synthesis conditions strongly affected the quality of SAMs. In this perspective, the reaction medium and the reaction time were identified as key parameters for getting controlled surface functionalization. Typical surface roughness was approx. 130 pm and SAM thickness was below 1 nm. SAM chemistry was investigated with XPS to confirm the presence of characteristic groups on the surface of glass. Finally, the application of SAMs to the crystallization of aspirin will be presented, discussing the impact of several surface chemistries on the nucleation kinetics.