

The 128th GREEN Seminar



Organic molecular architectures synthesized on silicon surfaces

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Building molecular architectures on inorganic semiconductor surfaces opens the route to combine conventional semiconductor technology with organic/molecular electronics. This could add additional functionalities to the established concepts in the context of "more than Moore". In order to realize such molecular structures on highly reactive semiconductor surfaces, a well-ordered monolayer of bifunctional molecules has first to be adsorbed on the semiconductor substrate. For the further layers, a reaction scheme has to be established which ensures controlled layer-by-layer growth without side reactions with the surface or in the layer. Here we address these challenges using selective click reactions based on substituted cyclooctynes [1]. The starting point is the Si(001) substrate which is functionalized via selective adsorption of a bifunctional cyclooctyne under UHV conditions. This first-layer sample is then transferred into solution in order to perform the subsequent layer-by-layer synthesis using the two orthogonal click chemistry reaction steps in an alternating fashion. This strategy opens the possibility for the controlled synthesis of layers with physical or physicochemical properties that alternate on the molecular scale. Experimental procedures and results, additional strategies, as well as fundamental studies on the mechanisms involved will be discussed.

[1] M. Dürr, U. Höfer, U. Koert, R. Tonner-Zech, *Acc. Chem. Res.* 58, 2454 (2025).

Venue: Rm. 811/812, 8F, Central Bldg.,
Sengen-site

Date & Time: 11:00-12:00, Monday, 30 March. 2026

Language: English

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