Group : Active Organic Surfaces
Project : **Covalent Attachment of Hydrosilane Derivatives onto Different Substrates**
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Keywords: Surface modification, Monolayers, Hydrosilanes

Introduction

Surface modification continues to be an extensive research topic as it has a wide range of applications in the fields of biotechnology, biosensing, micro- and nanotechnology. The most common strategies for surface modification are mainly the attachment of self-assembled monolayers (SAMs), followed by surface-initiated polymerizations or well-defined molecular layer deposition. Among them, the attachment of SAMs provides a simple and elegant approach, as it allows an easy tuning of both the properties as well as a desired follow-up reactivity or functionality of this inorganic substrate. Therefore, the development of milder, faster, and more robust methodologies for the attachment of SAMs is of utmost interest, as well as the attachment of monolayers onto highly relevant surfaces that hitherto resent surface modifications (think of many plastics). Effectively we're bringing one of the hottest trends in chemistry down to the surface itself: C-H functionalization.

Goal

It is known from literature that surface modification via Si−H bond activation can be achieved via the use of tris(pentafluorophenyl) borane ($B(C_6F_5)_3$) as a catalyst. However, some preliminary experiments indicate that there is a second approach that is not only catalyst-free, but is also more attractive as it allows for the easy formation of patterned surfaces. In addition, this new chemistry has significant potential to modify the surfaces of noble metals, such as Pt, and plastics.

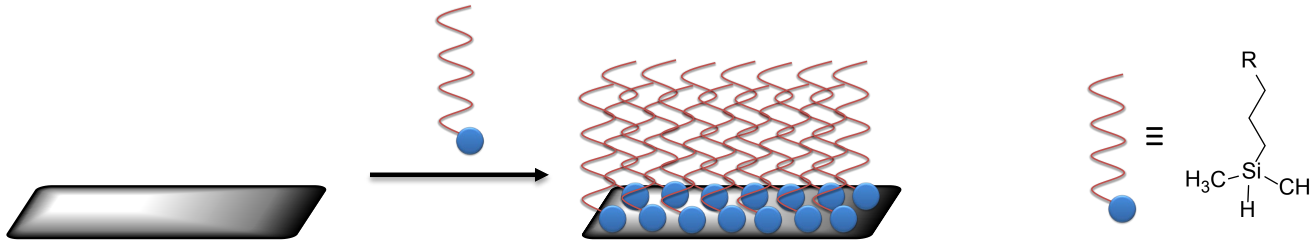

Figure 1. *Schematic representation for the immobilization of hydrosilanes on a solid substrate.*

Next, we are currently also tackling the even stronger, but also truly ubiquitous C-H bond. Initial research in this field has proven highly effective (microfluidic cells made from alkane-based polymers have been successfully modified) The goal of this project is therefore to synthesize new hydrosilane or related compounds with different functional groups, functionalize surfaces with those newly synthesized materials, and characterize the formation of the resulting monolayers. In this phase you will thus obtain hands-on experience with a range of state-of-the-art surface characterization techniques, including XPS en surface-sensitve IR. Finally, we aim to use these functionalized substrates to make better anti-fouling surfaces, i.e. surfaces that withstand the adsorption of proteins.

Specifics:

This work will be performed at the Laboratory of Organic Chemistry (WUR). This investigation can partially take place in combination with Surfix, a spin-off company of Wageningen University with high experience in chemical surface modification.

Techniques to be used

General organic synthesis techniques such as reaction set-up, TLC, column chromatography, NMR. Surface modification techniques: XPS, AFM, SCA, IRRAS.

Information

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