High-Resolution Approaches to Patterning of Silicon/Organics Interfaces

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Nanomaterials have in recent years attracted a great deal of scientific interest. On one hand interest focuses on possibilities to prepare and study materials with novel properties, which are encountered when nanosize dimensions are approached. On the other hand, a major thrust for shrinking dimensions originates from the microelectronic and microsystems field with a continuous demand for a higher degree of smaller devices, system integration and system diversification. New challenges arise from the integration of organic or bio-relevant matter in materials- and surface science. For nano- or biomaterials to be exploited directly in form of devices in today's predominant Si-technology these nanostructures need to be immobilized on a Si wafer.

A wide range of methods to locally functionalize surfaces (including silicon) have been intensively explored in recent years and in many cases have found successful technological application. Most of these nano- and micropatterning techniques are based on lithography, and hence demand a masking process.

In contrast to masking approaches, far less attempts have been made to employ direct structuring processes.
The work presented, explores a range of techniques (e-beam writing, AFM/STM) to achieve high resolution patterning of silicon surfaces modified with covalently attached organic monolayers. Such monolayers may serve as linkers for a whole range of biochemical species.

The principles of the different approaches, the potential and limits of the techniques as well as the functional properties of the patterned structures will be discussed.