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SILICON CHIPS FOR LOCAL AND SELECTIVE IMMOBILIZATION IN DIAGNOSIS

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The presence of many single-stranded antibodies that bind to DNA often result from autoimmune reactions or viral infections. Method for label-free diagnosis of inflammatory processes comprises incubating solid phase immobilized DNA-probes with single stranded nucleic acid analytes for forming a hybridizing complex. Chemical treatment of glass slides by GOPS/poly-L-lysine is typically used to immobilize DNA-probes. Nevertheless, it has been estimated that nearly half of all cases of autoimmune diseases remain undiagnosed because of the challenges posed by diagnosis including immobilization of DNA-probes. Therefore, there is still a strong demand for the development of smart chips with high accuracy, selectivity, lower detection limits and robustness during autoclaving for sterilization, incubation, and cryogenic applications for shock freezing. We have fabricated a silicon chip with a charge pattern in order to realize defined microscopic to nanoscopic patterns of surface-near electrostatic forces (SNEF). Finally, these charge patterned silicon wafers are protected by a thin 2-3 nm thick insulting oxide layer. Using combined atomic and Kelvin probe force microscopy measurements (KPFM) we could prove that positively and negatively charged species are preferentially adsorbed at n-type and p-type conducting regions of the of locally implanted silicon chips with different SNEF patterns. The selective attachment of biological species on flat silicon chips will also play a critical role towards advancements in the field of diagnosis of inflammatory process. Herein we present a promising concept for selective biomolecule assembly onto the bulk-functionalized PolCarr® chip. The binding of the electrically polarizable biological species is onto PolCarr® is purely driven by SNEF. The design of PolCarr® can be adjusted to the individual target application, e.g. local immobilization of DNA probes. We believe the unique features of the PolCarr® chips make it a promising solution to meet increasing health standards and awareness of autoimmune diseases.