

Development of a simple technique for the uniform density control of nanoparticles

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A uniform distribution of Au NPs on the silicon surface can be obtained using thiolated-coated Au NPs and a 3-MPTMS modified silicon surface. When the process is carried out using only a 3-MPTMS-modified silicon surface, a uniform distribution of Au NPs is not achieved. Indeed, these Au NPs agglomerate together to form large clusters. The density of Au NPs was determined to be influenced by the initial concentration of Au NPs used, as well as the time allowed for deposition, and the concentration of 3-MPTMS. However, the density of Au NPs did not increase with increasing deposition time when the concentration of Au NPs was increased above a certain point. This is because silicon surfaces functionalized by 3-MPTMS react with thiolated Au NPs over a short period of time. In addition, a high concentration of 3-MPTMS generates unwanted clusters, which prevent the development of a uniform distribution of Au NPs on the modified silicon surface. This new approach could provide a significant contribution to the ongoing efforts to minimize tribological-related issues and implement biomolecular analysis systems in a microfluidic chip.