Supporting Information

Micro-Patterning of Au NPs on PEG Hydrogels Using Different Silanes To Control Cell Adhesion on the Nanocomposites

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1. FTIR-analysis of amino-silane pattern on silicon wafer

FTIR analysis with a Ge-ATR crystal was carried out for the verification of self-assembled amino silane layer grafted onto the activated silicon substrate surface by µCP. Figure S 1 depicts the spectra of a cleaned and activated silicon surface before (a) and after (b) silanization with (3-Aminopropyl)trimethoxysilane (amino-silane).

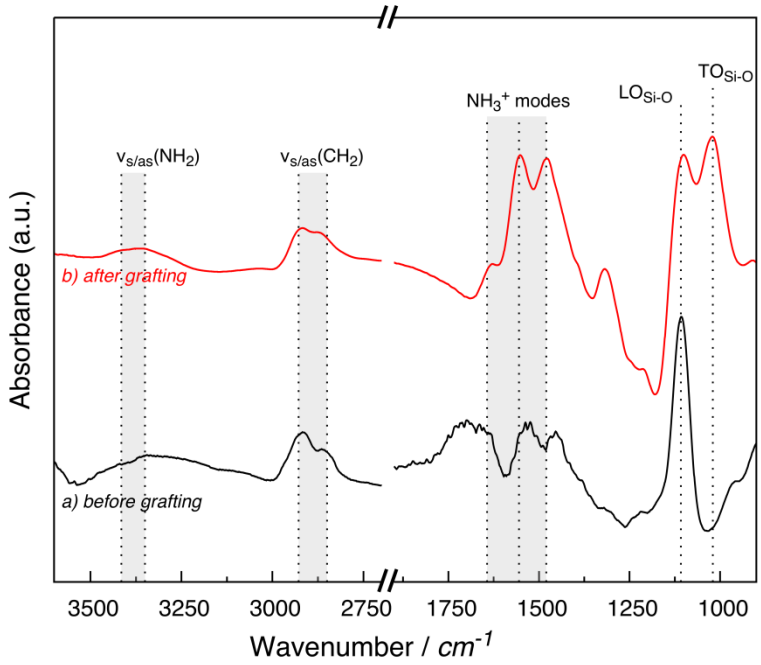

Figure S 1: Ge-ATR spectra: Cleaned Si wafer before (a) and after (b) silane grafting with aqueous APTMS solution via µCP. LO_{Si-O} and TO_{Si-O} refer to longitudinal optic (LO) and transverse optic (TO) components of the asymmetrical Si–O–Si stretching mode; NH_3^+ comprises the NH_2 scissor vibration (~1555 cm^{-1}) as well as the symmetric and asymmetric NH_3^+ deformation modes.

Broadened bands around 3350 and 1670 cm^{-1} identify, as expected, the activated Si–OH groups before silanization (Figure S 1a) due to the HO– stretch vibration and hydrogen bounded water molecules. However, observed symmetric and asymmetric CH_2-stretching vibrations ($\nu_{s/as}(CH_2)$) suggesting some organic contaminations despite intense cleaning procedure.

The successful coupling with the offered amino silane (Figure S 1b) is clearly recognizable by means of NH_3^+-deformation modes around 1480 and 1642 cm^{-1} and the NH_2 scissor vibration present at 1555 cm^{-1}, all arising from the terminal amino group of APTMS molecules. In this context, only weak NH_2 stretching modes around 3280 and 3350 cm^{-1} can be seen owing to a peak dipole moment of this group. Furthermore, the findings for the presence of grafted NH_2-silane layer on silicon are supported by characteristic Si–O–Si stretching modes around 1020 cm^{-1} that add to the lateral connectivity of growing silane monolayers. Phonon splitting of the asymmetric Si–O–Si stretch allows the distinction between perpendicular oriented ($LO_{Si\text{-}O}$) stretch modes at 1110 cm^{-1}, as also present in activated silicon surfaces, and additional parallel oriented ($TO_{Si\text{-}O}$) modes indicating lateral connected silicon oxide bridging units of assembled and immobilized silane monolayer on the substrate.

2. Micro-patterning of Au NPs on PEG hydrogels with different pattern structures

Using this present method, which relies on micro-contact printing, any pattern size and shape can be obtained, depending on the design of the stamp. As an example a stamp with dot-like topographic patterns was prepared, using a stamp with pillars of ~50 µm diameter and spacing. In Figure S 2 the resulting, regular dots pattern of Au NPs on PEG hydrogel can be seen.

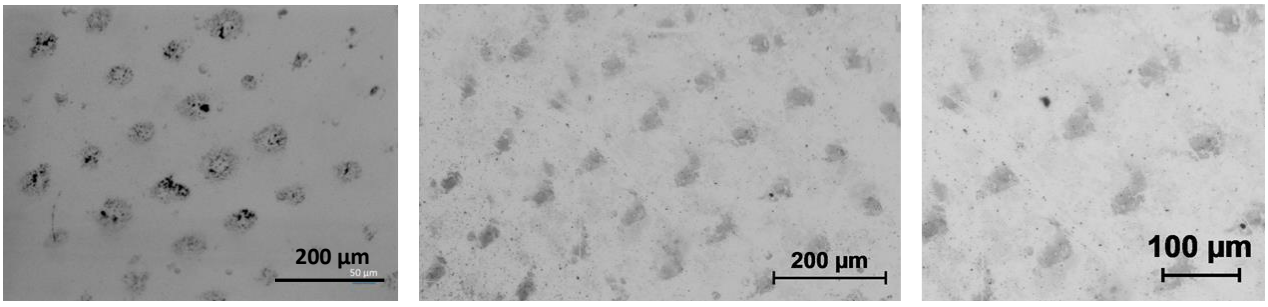

Figure S 2: Optical micrograph of dot-micro-patterned Au NPs on PEG hydrogel surfaces.

3. Cell adhesion studies on Au NPs micro-lines

Cell adhesion on these surfaces has been investigated. After 24 h of cultivation time the cells were clearly adhering and stretching either along the Au NPs lines, were staying between the lines on the PEG area or were stretching nearly perpendicular to the Au NPs pattern lines. Some representative cells are encircled in Figure 9. Elongated and aligned cells are marked with blue circles, while bridging or round cells on PEG are marked with green or pink circles in Figure 9. In Table S 1 the amount of cells on the specific pattern areas is presented:

Table S 1: Quantification of the number of cells adhering to the Au NPs or the PEG-hydrogel lines, and assessment of the alignment to the Au NPs-containing lines.

Number of cells on Au NPs lines	Number of cells on PEG	Number of cells bridging over Au NPs lines	Total number of cells	Cells aligning with 0°-10° angles on Au NPs lines [%]	Total amount of cells attached on Au NPs [%]
66	16	14	96	**69**	**83**
123	17	29	169	**73**	**90**
76	14	20	110	**69**	**87**
28	5	2	35	**80**	**86**
40	17	13	70	**57**	**76**
55	9	15	79	**70**	**89**
112	11	19	142	**79**	**92**
				86 ± 5	**71 ± 8**