Supplemental Materials

Selective Adsorption

The parts were rinsed in an aqueous solution of eosin Y, an anionic red dye. Parts treated with PAc and PVA showed the same yellow colour as moulded unmodified PEEK parts. The parts modified with PAAm and PEI, however, exhibited a red colour, typical for eosin. The staining could not be removed by rinsing with water. This pointed to a specific adsorption of eosin. Consequently, the surface was rendered cationic during the surface modification.

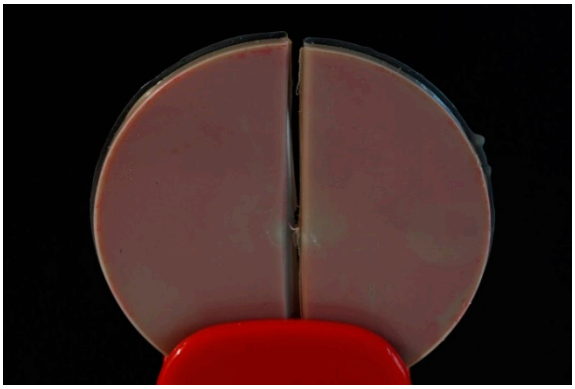


Figure S1. PEEK part modified with PAAm immersed in 10^{-3} M eosin Y solution for 10 min. The modified PEEK part showed a red colour, which pointed to a specific adsorption of eosin Y to the cationic groups of PAAm.

EDX

SEM-EDX investigations were made with an Ultra Plus Gemini microscope (Carl Zeiss SMT GmbH, Germany) using an XFlash 5060 F EDX detector (Bruker Nano GmbH, Berlin, Germany). The parts were rinsed in copper sulphate solution for marking the amino groups, exploiting the complex formation between amino groups and the copper ion. After drying, they were coated with a Pt layer of 3 nm thickness by sputtering using a Leica EM SCD 050 (Leica Microsysteme GmbH, Wetzlar, Germany).

Parts were first rinsed in copper sulphate solution, then with water and dried. The EDX spectra of parts modified with PEI exhibited peaks of Cu (L) as well as S (K). This pointed to chemisorption of copper due to formation of a very stable chelate complex with amino groups, and thus, is an indication, that the amino groups are still functional and accessible, despite the thermal treatment during molding.

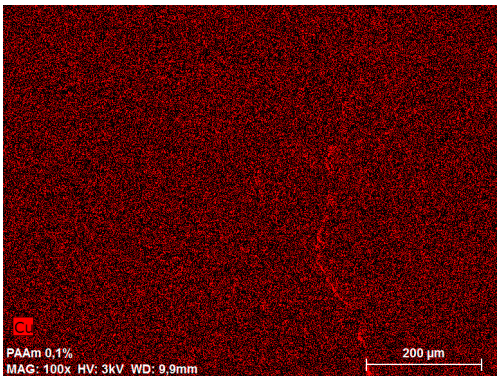


Figure S2. EDX mapping of a PEEK surface, modified by PAAm during moulding. Cu ions are used as marker for amino groups. They are red-coloured in the picture. The Cu is evenly distributed over the area.

Zeta Potential of PEEK Surfaces Grafted with PEI

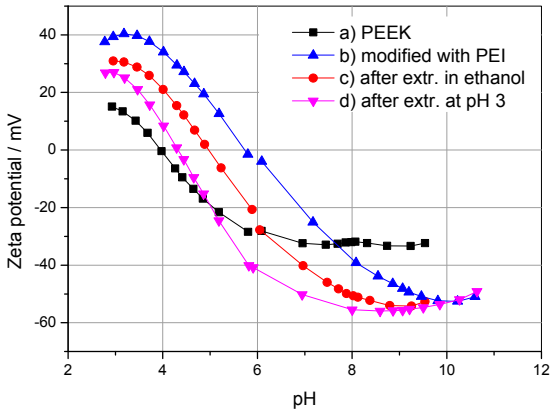


Figure S3. Zeta potential as a function of pH for different samples. The plain PEEK surface exhibit an isoelectric point of about 4. The isoelectric point of the PEEK surface modified with PEI during moulding was at 6. Note, only a thin PEI layer was applied to the mould surface (25 mg m^{-2}), in contrast to the investigation in the main article. After extraction in ethanol, it shifted to 5, obviously due to removing of non-bonded PEI. However, the low values at high pH pointed to a sufficiently thick layer of a functional polymer on the surface. After extraction in hydrochloride acid almost the original isoelectric point was retained, pointing to further removal of PEI due to acid catalysed hydrolysis of the azomethine bond. Possibly, a small residue of PEI re-adsorbed by electrostatic effects and could not be removed completely by acid extraction, resulting a small shift of the isoelectric point.

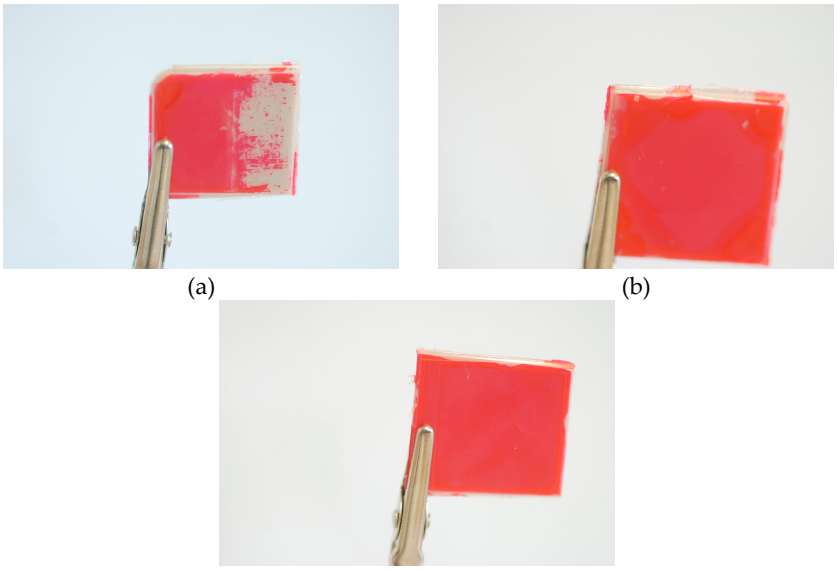
Plating/Seeds

For metallisation experiments, the plates produced were shaken first in a colloidal solution of gold nanoparticles (AuNP, 20 nm diameter in average) for 30 min. The synthesis of the AuNP was made using the approach first described by Turkevich and Frens. After rinsing with water and drying, the plates were dipped in a copper bath, consisting of a solution of 6.25 $g \cdot L^{-1}$ $CuSO_4 \cdot 5H_2O$, 8 $g \cdot L^{-1}$ EDTA, and 0.11 $g \cdot L^{-1}$ $NaBH_4$ at room temperature. The pH of this solution was adjusted to 12 by adding NaOH. The plates were then rinsed with water and dried.

The metallised plates were cut with a cross-hatch (Erichsen Mehrschneidegerät 295/I with 6 blades, Erichsen GmbH & Co. KG, Hemer, Germany). An adhesive tape was fixed on the metal layer thoroughly that was then removed at an angle of 90° to test the adhesion of the metal layer. The metal layer thickness was measured by x-ray fluorescence analysis (XFA) using a Fischerscope Xray Xan 220 (Helmut Fischer GmbH + Co. KG, Sindelfingen, Germany).

Figure S4. PEEK part modified with PAAm, one half immersed in an AuNP solution for 60 min. The red colour points to adsorption of the AuNP onto the grafted polyamine layer.

Preparation of Hydrogel Layers on PEEK



(a) (b)

(c)

Figure S5. Photographs of different PEEK plates, spin-coated with a hydrogel (Polyvinylamin + Glyoxal) and stained with Eosin Y. The intense red colure of all three PEEK plates revealed the formation of the hydrogel containing amino groups on the part surfaces. After staining, an adhesive tape was peeled off. (**a**) Plain PEEK: No adhesion of the hydrogel layer to PEEK, (**b**) PEEK plate modified with PEI, (**c**) PEEK plate modified with PAAm. Both hydrogel layers exhibit high adhesion to the modified PEEK surface.

Contact Angles after Extraction in Ethanol, Raw Data

Table S1. Raw data of contact angle measurements.

PEEK Reference					
Drop number	θ_a	δ	θ_r	δ	Hysteresis
1	82.13	0.35	49.43	0.34	32.70
2	80.23	0.45	53.25	0.61	26.98
3	80.22	0.46	51.52	0.26	28.70
4	78.63	0.44	48.33	0.43	30.30
5	79.70	0.42	55.35	0.67	24.35
Ø	80.18	0.90	51.58	1.56	28.61
PEI					
Drop number	θ_a	δ	θ_r	δ	Hysteresis
1	65.12	0.37	10.00	*	55.12
2	64.34	0.32	10.00	*	54.34
3	64.75	0.57	10.00	*	54.75
4	69.95	0.53	14.27	0.63	55.68
5	75.13	0.35	17.59	0.51	57.54
Ø	67.86	0.32	12.37	0.00	55.49

PAAm					
Drop number	θ_a	δ	θ_r	δ	Hysteresis
1	85.73	0.57	10.00	*	75.73
2	84.98	0.56	10.00	*	74.98
3	81.16	0.50	10.00	*	71.16
4	86.78	0.47	10.00	*	76.78
5	82.16	0.48	10.00	*	72.16
Ø	84.16	2.00	10.00	0.00	74.16
PVA					
Drop number	θ_a	δ	θ_r	δ	Hystereis
1	80.11	0.30	52.90	0.53	27.21
2	83.21	0.36	55.32	0.49	27.89
3	85.07	0.29	51.86	0.55	33.21
4	85.74	0.28	50.20	0.51	35.54
5	81.27	0.35	54.32	0.36	26.95
Ø	83.08	2.05	52.92	1.45	30.16
PAc					
Drop number	θ_a	δ	θ_r	δ	Hysteresis
1	85.36	0.33	54.83	0.33	30.53
2	82.12	0.43	55.78	0.25	26.34
3	80.27	0.43	52.89	0.64	27.38
4	83.73	0.45	45.06	0.46	38.67
5	84.27	0.30	51.91	0.50	32.36
Ø	83.15	2.10	52.09	1.20	31.06

* The receding angle is lower than 10° and cannot be measured exactly; θ_a mean advancing angle; θ_r mean receding angle; δ standard deviation, at least 10 measurements averaged during advancing/receding.