separations

Supplementary materials

High-purity corundum as support for affinity extractions from complex samples

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DLS measurements of corundum powder F1200

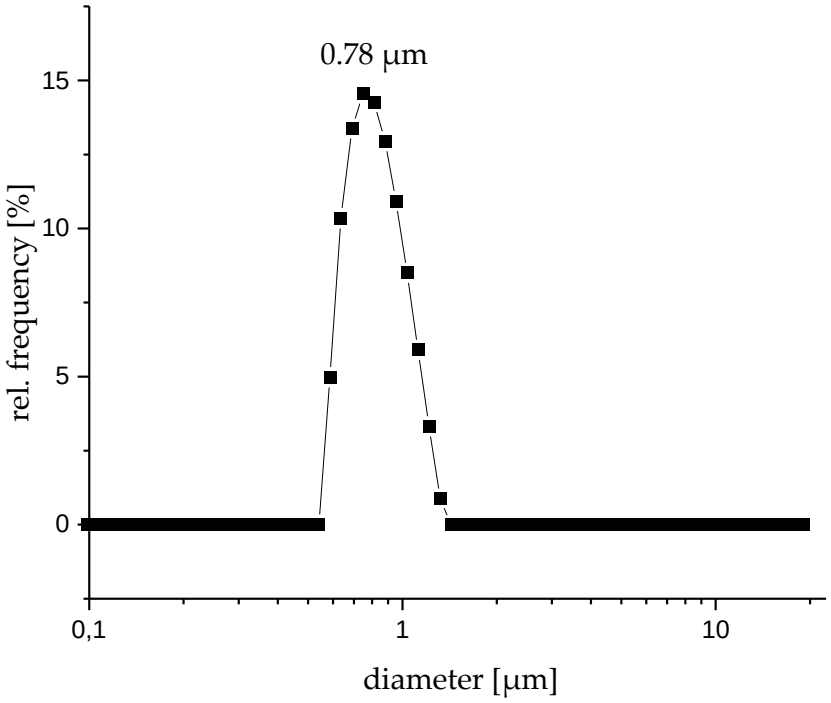

Figure S1. Dynamic light scattering (DLS) measurements of corundum F1200 in 0.1 M PBS indicated an average particle size of 0.78 µm.

Purification of corundum

A scanning transmission electron microscope measurement combined with an energy-dispersive X-ray spectroscopy (EDX) analysis revealed that impurities of sodium and chlorine-containing needle-shaped crystal structures were detected covering the corundum surface (Figure S2). A purification protocol was established to eliminate these impurities and form a clean corundum surface (Figure S3). BET- measurements, before the purification protocol was performed, indicated a corundum surface of 5.2 m^2/g, whereas, after the purification, the surface decreased to 4.5 m^2/g (Figure S4). This decrease in surface area was to be expected since the needle-shaped structures had been removed completely.

TEM micrographs of unpurified and purified corundum

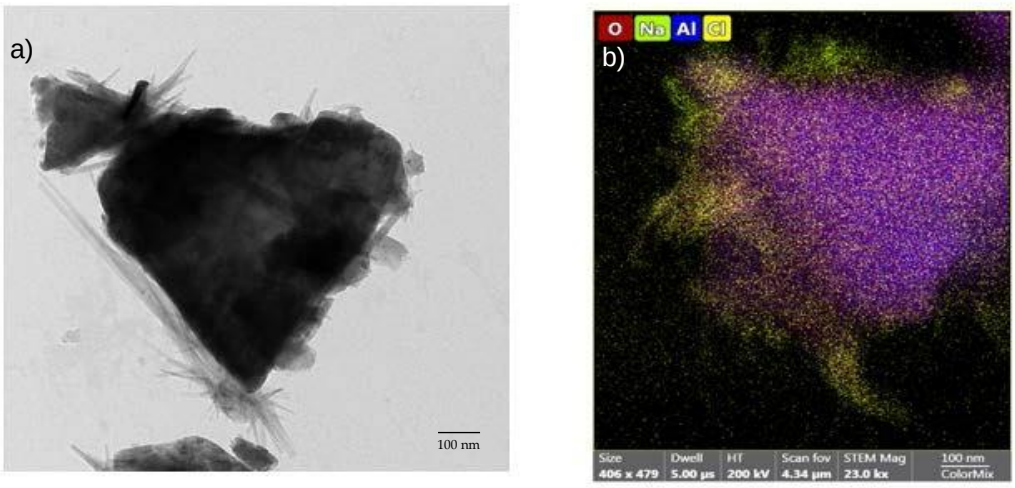

Figure S2. TEM micrograph of unpurified corundum. a) Corundum surface covered with needle-shaped crystals. b) Elemental mapping showing sodium- and chloride-containing structures.

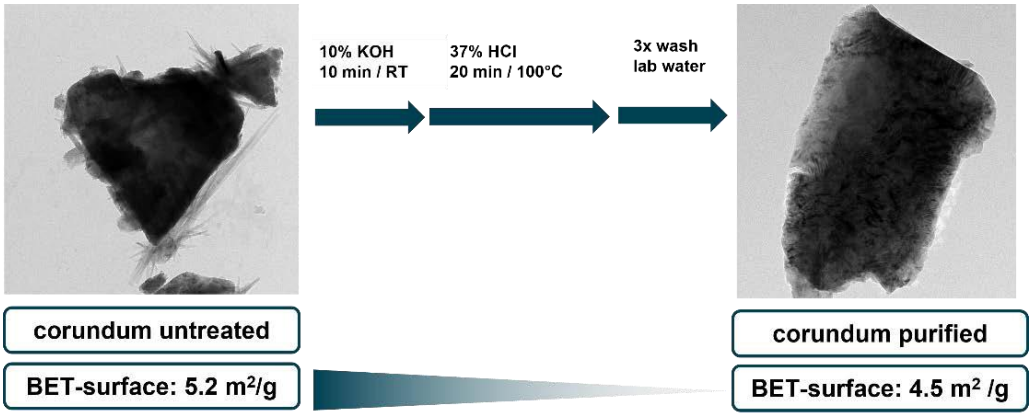

Figure S3. Purification protocol for corundum powder.

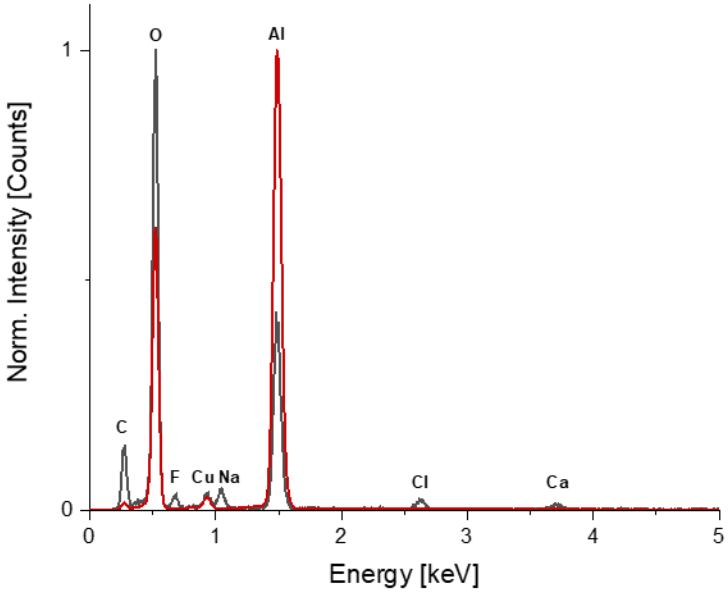

Figure S4. TEM-EDS analysis of corundum before (black) and after (red) purification.

BET plots

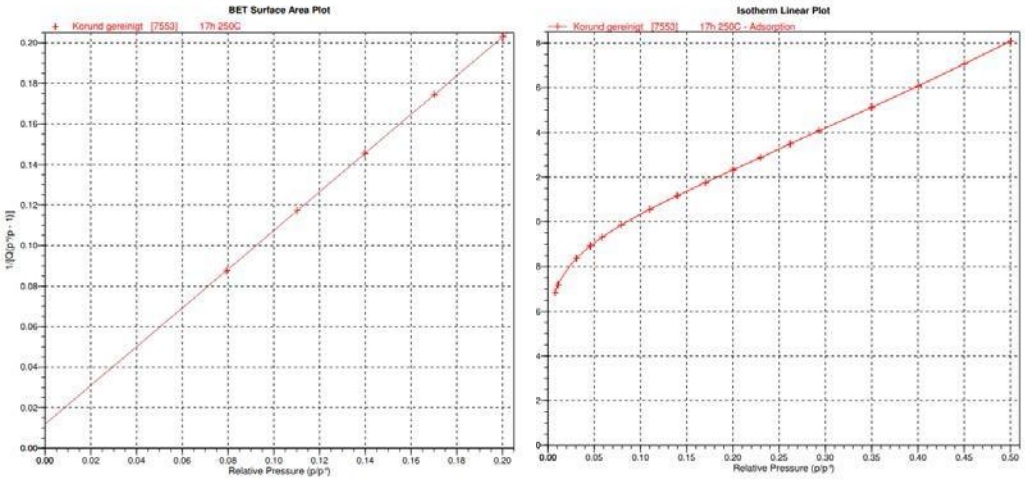

Figure S5. BET measurements. Isotherm linear plot and BET surface area plot.

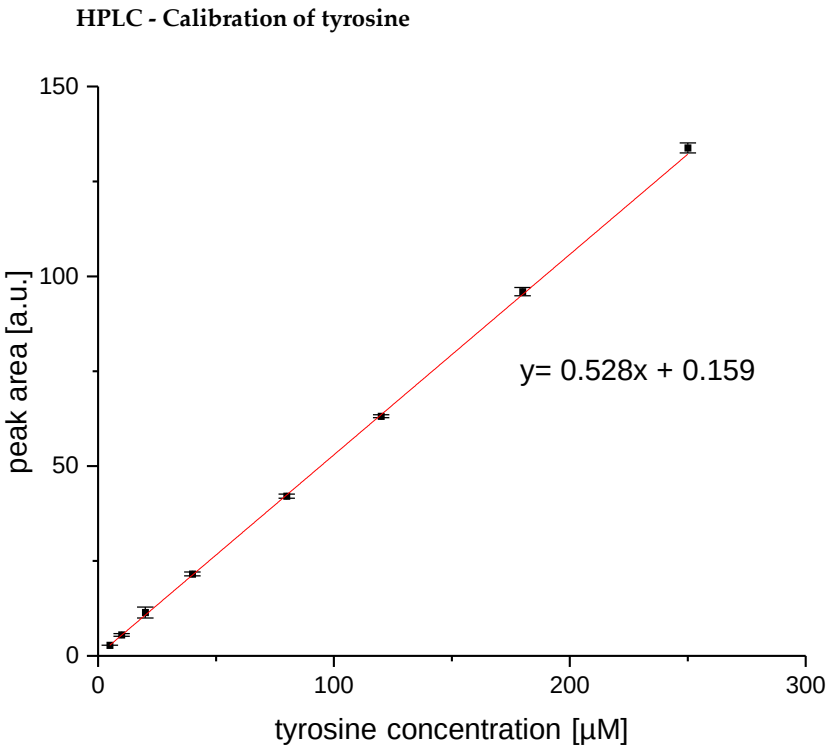

Figure S6. Calibration line of tyrosine (amino acid standard solution). Fluorescence detection was performed at 272 nm (Ex.) and 303 nm (Em.).

TEM-EDS of 12-APA functionalized corundum

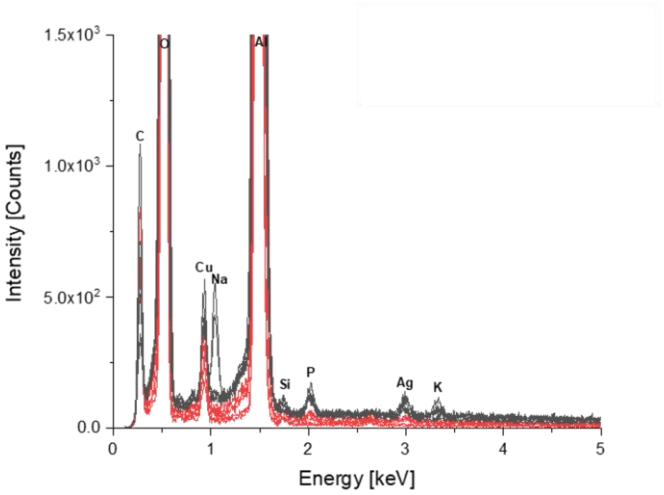

Figure S7. TEM-EDS analysis of corundum before (red) and after (black) 12-APA functionalization.

^{1}H NMR of polyglycerol vs. oxidized polyglycerol

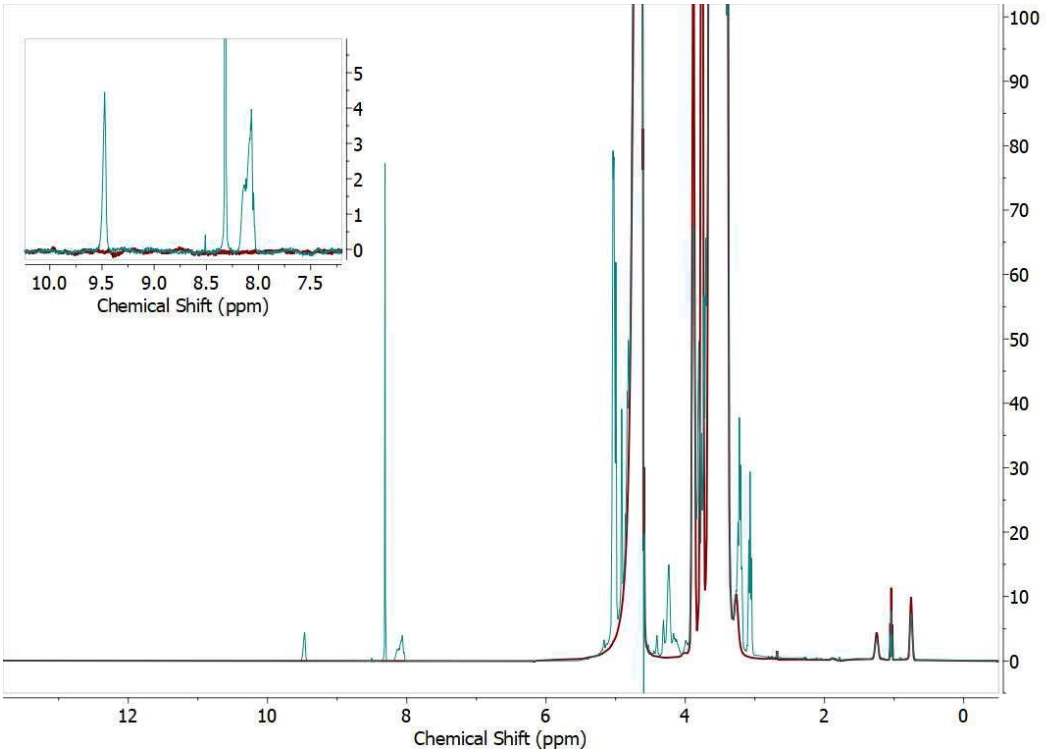

Figure S8. ^{1}H NMR of untreated polyglycerol (PG, red line) and oxidized PG (blue line). The NMR signal at a chemical shift at around 9.5 ppm indicates a terminal aldehyde of the polyglycerol that was formed due to the oxidative cleavage with $NaIO_4$. The very sharp singlet at a chemical shift of about 8.3 ppm corresponds to formic acid, also a product of the cleavage.

ESEM micrographs of functionalized corundum

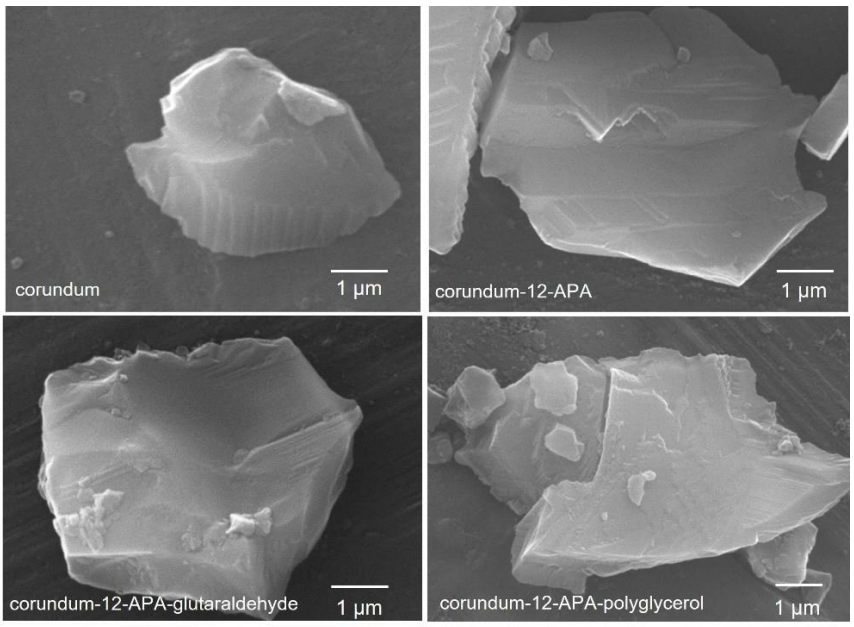

Figure S9. ESEM micrographs of functionalized corundum. A surface layer was not visible.

Evaluation of non-specific binding (NSB)

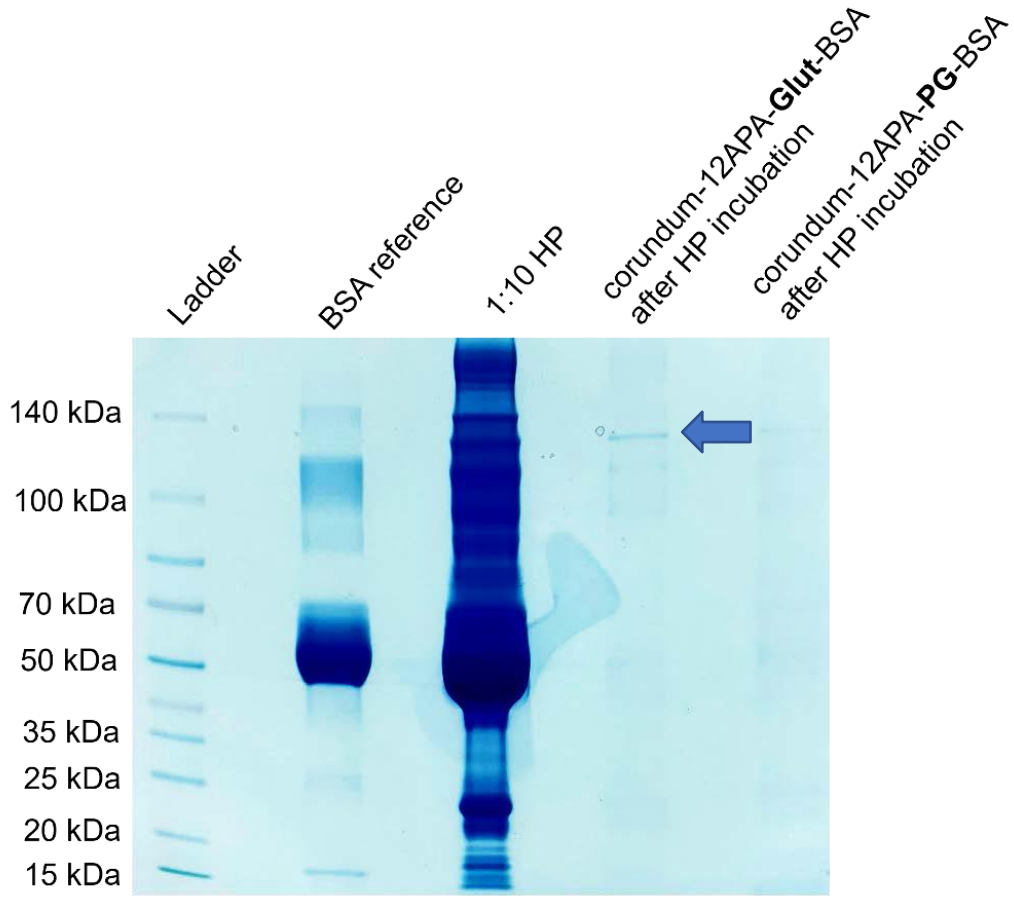

Figure S10. SDS-PAGE of corundum functionalized with bovine serum albumin (BSA), conjugated with glutaraldehyde or polyglycerol. The functionalized corundum was incubated with 1:10 diluted human plasma (HP). After the elution with 2% of SDS, almost no protein elution was detected for the polyglycerol/BSA functionalized corundum, whereas for the glutaraldehyde/BSA at least one weak protein band (arrow) is visible. Furthermore, no elution (leaching) of the covalently bound BSA was observed.