Strategies for chalcogenide thin film functionalization

Supporting Information

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Figure S1. Deposition process of thin film chalcogenide by co-evaporation. Pure germanium (Ge) was melted and evaporated by electron beam bombardment whereas selenium (Se) and tellurium (Te) were evaporated by current-induced heating. According to the evaporation cones, the homogeneous zone of deposition match with the substrate position. The pressure in the chamber during the process is $2.10^{-7}$ mbar.
Figure S2. Surface topography (2 × 2 µm²) and cross section profile of Ge-Se-Te films by AFM tapping mode. Raw Ge-Se-Te (a) and subsequent functionalization with LLA-biotin (b) followed by BSA and STV (c), raw Ge-Se-Te (d) and subsequent functionalization with SVS-biotin (e) followed by BSA and STV (f), and raw Ge-Se-Te (g) and subsequent functionalization with APTES and NHS-biotin (h) followed by BSA and STV (i).
Figure S3. Water Contact Angle measurements. The water drop shape reveals the affinity of water towards the surface. The more spread the drop, the more affinity for the surface and the more hydrophilic the surface is. The water contact angle describes this drop spreading in a meaningful quantitative value to assess the hydrophilic or hydrophobic property of surfaces. The software we used automatically determine the WCA value from the drop picture according to both left and right angle.

As an example, the pictures above reveals less spread drop for the chalcogenide 1 (on the left). Therefore, the WCA is higher, and this chalcogenide is defined as more hydrophobic.

WCA 1 > WCA 2
Figure S4. Example of the circle equivalent area diameters (CED) obtained from the particles analysis performed the AFM height image of the fully functionalized Ge-Se-Te surface. The CED is the diameter of a perfect circle that has the same area as the particle.
Figure S5. Example of the particles height analysis performed on the AFM height image of the fully functionalized Ge-Se-Te surface. The height is the difference between the smallest and biggest relative height.
Figure S6. Example of the particles circularity obtained from the analysis performed on the AFM height image of the fully functionalized Ge-Se-Te surface. The circularity is the ratio of the area of the particle divided by the area of a circle with an equivalent perimeter length. The more circular a particle the closer to 1 this value will be.
**Figure S7. Water Contact Angle measurements** on the Ge-Se-Te substrates before and after incubation of peptide, biotinylated peptide, plasma activation and subsequent incubations of proteins.
Figure S8. Hydrophobic/hydrophilic index value of the (a) LLADTTHHRPWT and (b) SVSVGMKPSRP peptides. (c) Physico-chemical properties of the two selected peptides (without the biotin moiety): $pI$, isoelectric point; $II$, instability index of a peptide: $II<40$ predicts a stable, $II>40$ an unstable peptide; $AI$, aliphatic index and $H$, hydropathicity. Values are calculated using compute programs on http://expasy.org. H is calculated as the sum of hydropathy values from Kyte and Doolittle (1982) of all the amino acids, divided by the number of residues in the sequence. The aliphatic index ($AI$) has been calculated as a measure of the relative volume occupied by aliphatic side chains of the alanine, valine, leucine, and isoleucine amino acids. Highest is the AI more thermostable is the peptide.
Figure S9. Infrared spectrum of a Ge-Se-Te film deposited onto a cover slip.
**Figure S10. Secondary structure** of Bovine Serum Albumin (BSA) and Streptavidin (STV).