

Supporting information

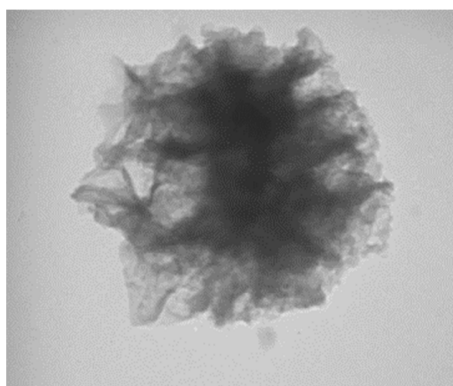


Figure S1. TEM graphs of KCC-1-NH-CS₂ in various magnifications.

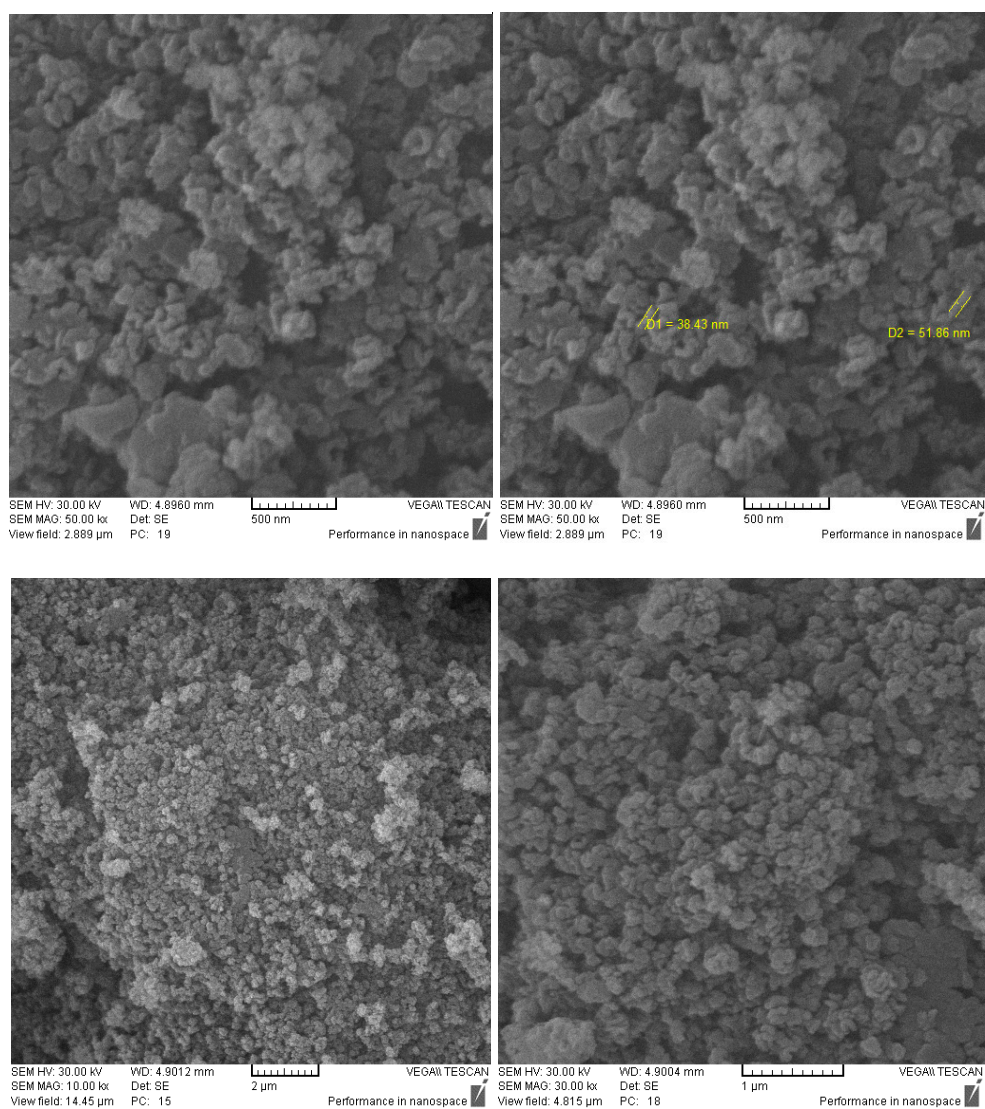
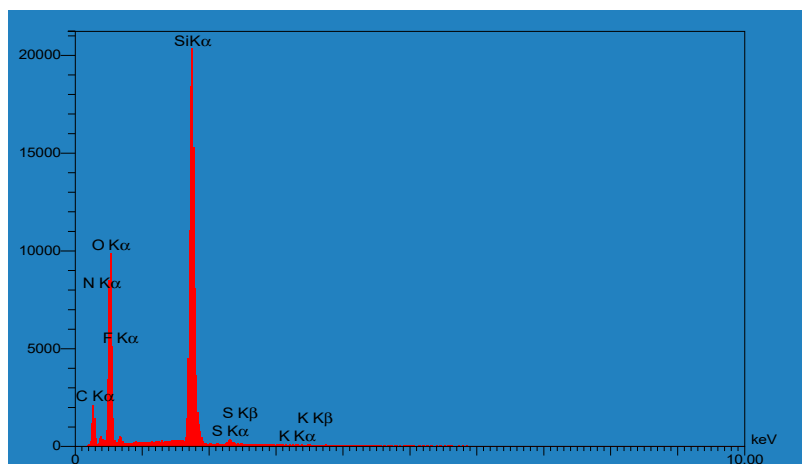


Figure S2. FESEM graphs of KCC-1-NH-CS₂ (C).

Finally, EDAX was carried out for tracing of expected elements in KCC-1, KCC-1-NH₂, and KCC-1-NH-CS₂. As shown in Fig. S3A, KCC-1 mainly consists of O and Si. Functionalizing KCC-1 with NH₂ and after that with CS₂, N elements and S elements increased respectively, which proved the formation of KCC-1-NH-CS₂. The FTIR spectra of KCC-1 and KCC-1-NH-CS₂ are shown in Fig. S3B. The characteristic peaks of the KCC-1 appear at 802 and 1100 μm^{-1} correspond to the symmetric and asymmetric stretching vibrations of the Si-O-Si bond, respectively. New peaks have been observed in the KCC-1-NH-CS₂ spectrum at 1626 cm^{-1} (deformation NH₂), 2520 cm^{-1} (stretching vibration of S-H in mercaptan groups), 2890 cm^{-1} (stretching vibration of aliphatic C-H), and 3400 cm^{-1} (vibration of N-H bond), which confirm the presence of the related functional groups and proves the successful modification of the KCC-1 surface.



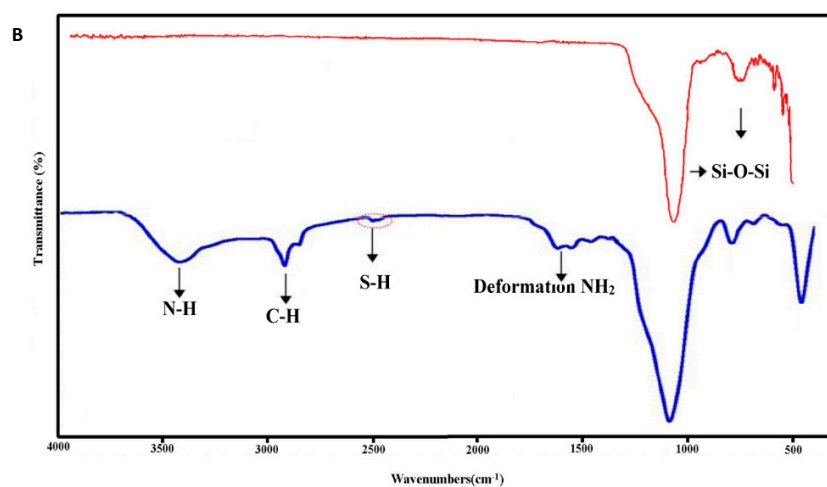


Figure S3. A) EDAX analyses of KCC-1, KCC-1- NH_2 and KCC-1- NH-CS_2 . B) FTIR spectra of KCC-1 and KCC-1- NH-CS_2 .

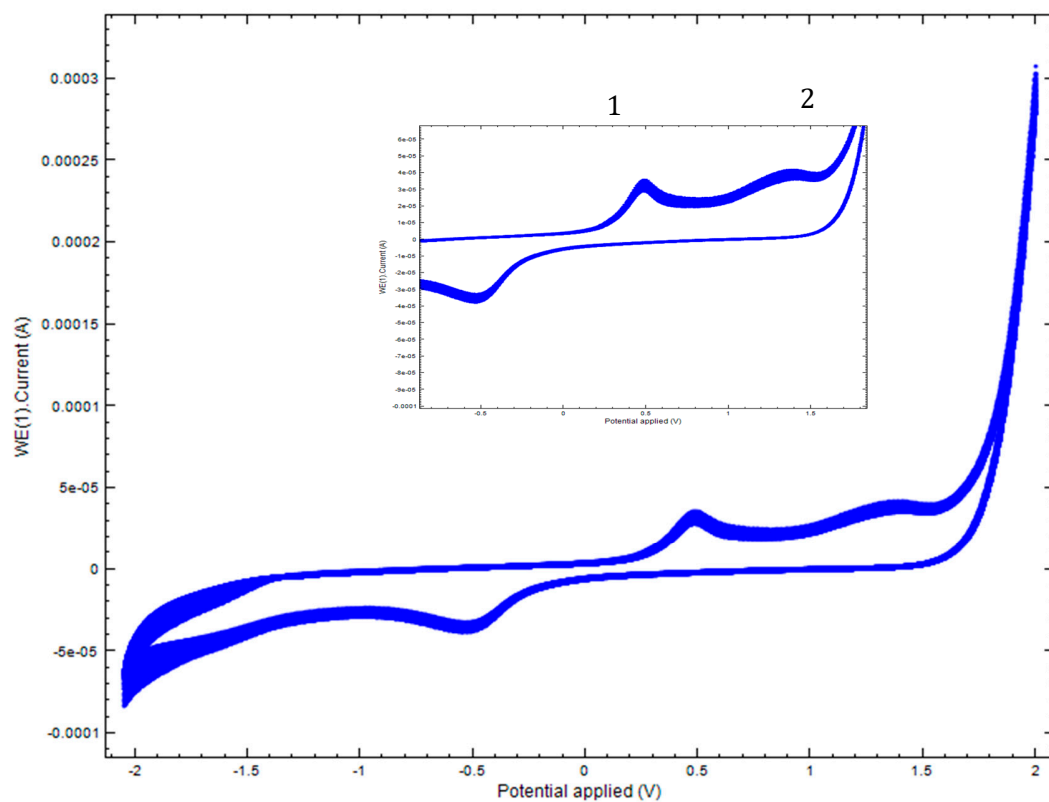
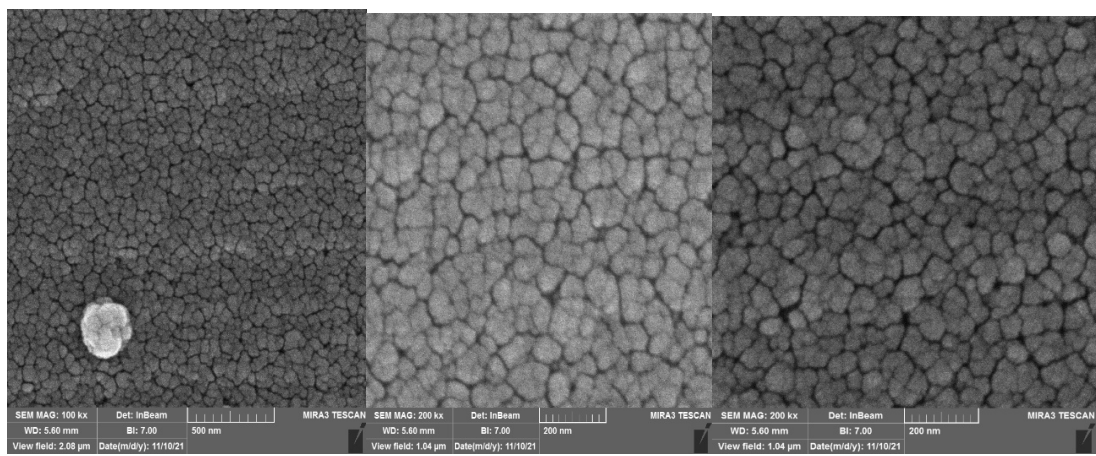
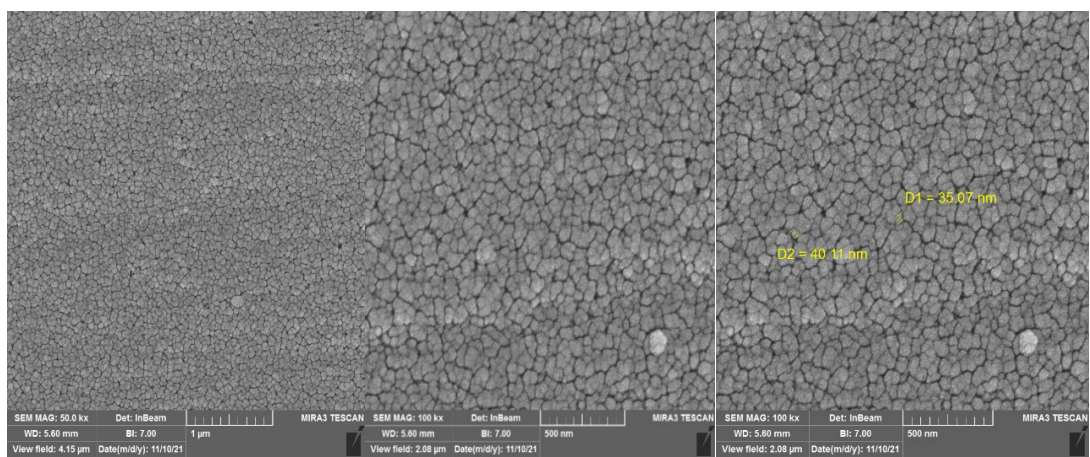
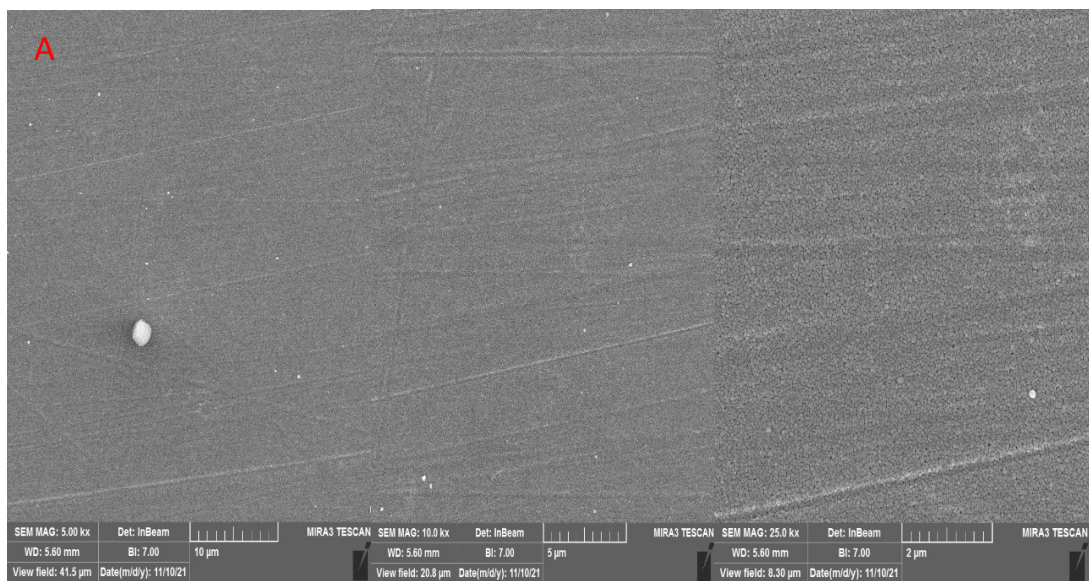
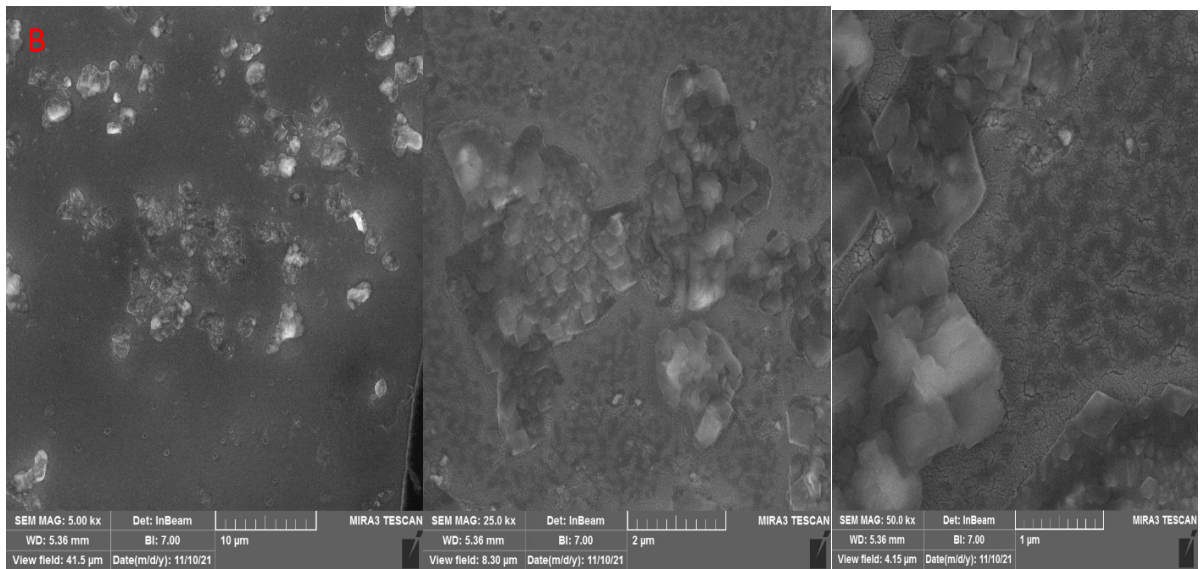
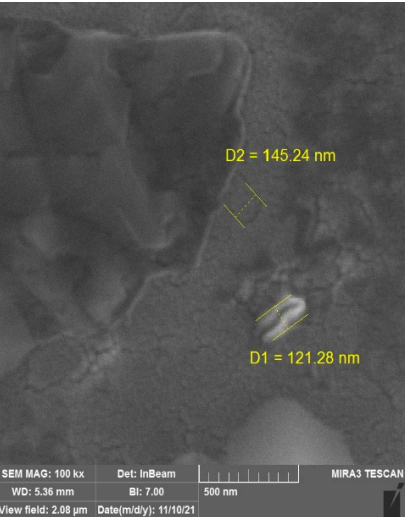
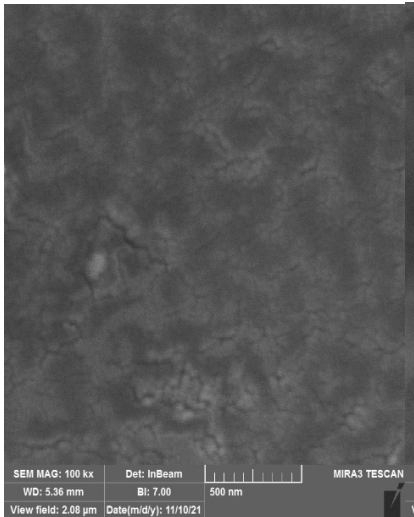
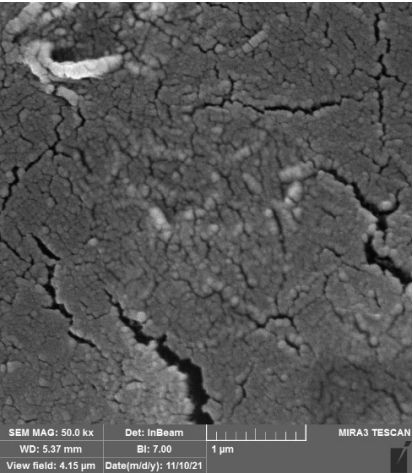
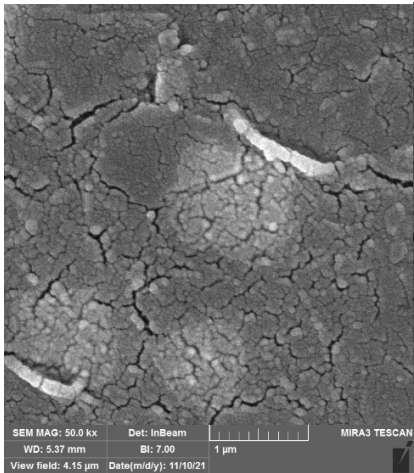


Figure S4. A) Electropolymerization of 6 mM β -CD in 0.05 M PBS (pH=4) as a supporting electrolyte on the surface of GCE. The cyclic voltammogram depicts gradual growth of β -CD after 40 successive cycles in the range of -2 to +2 V vs. Ag/AgCl with a scan rate of 0.07 V/s. Inset: three current peaks of β -CD electropolymerization.







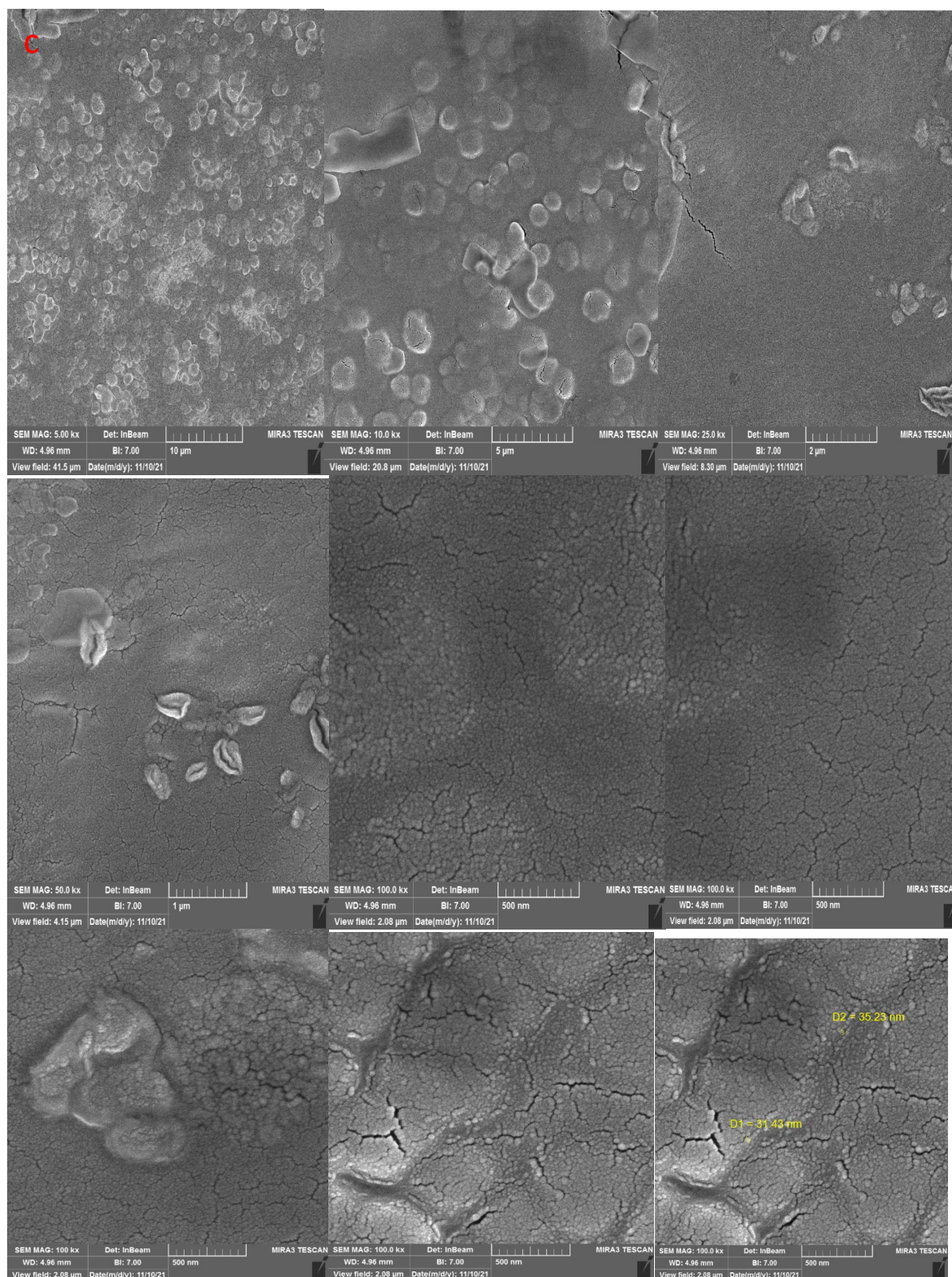


Figure S5. FE-SEM images of the sequential modified layers on GCE: A) β -CD, B) β -CD – KCC-1-NH-CS₂-Ab C) β -CD – KCC-1-NH-CS₂-Ab-BSA-Ag in different magnifications.

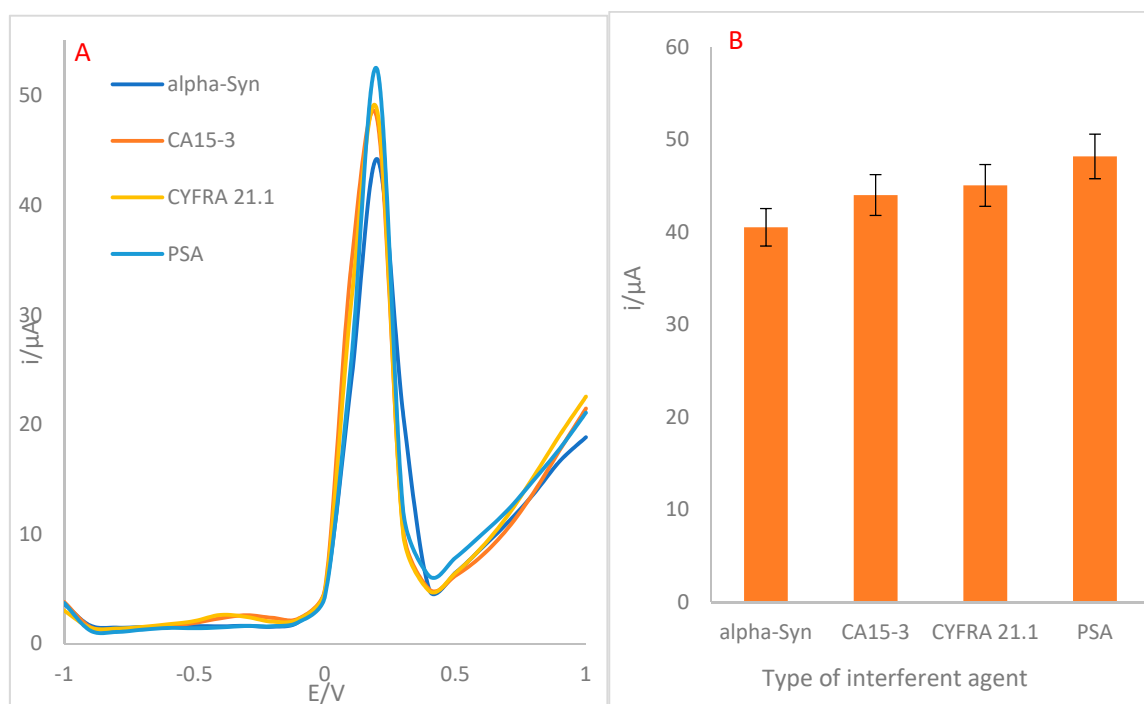


Figure S6. A) DPV of GCE- β -CD-KCC-1-NH-CS₂-Ab-BSA in the presence of α -syn and three other interferences. The supporting electrolyte was 0.05 M solution [Fe (CN)₆]^{3-/4-}/KCl; the potential range was from -1 to 1. B) comparison of α -syn and three other interferences peak current. (SD=2.28, n=4).

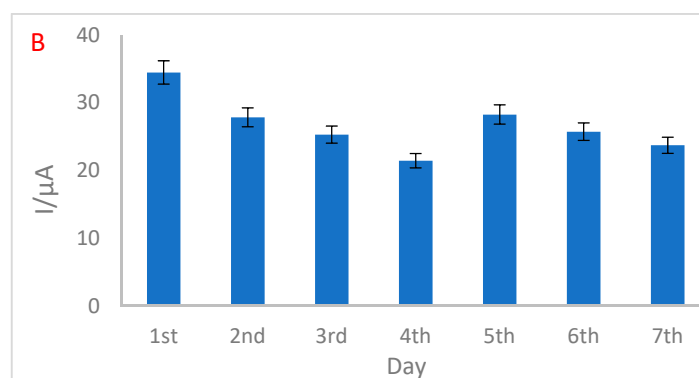
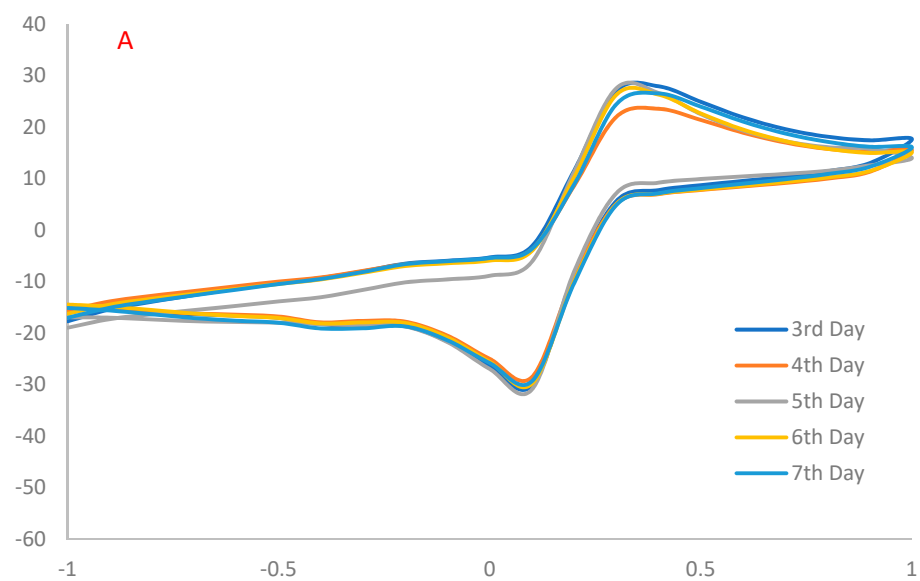


Figure S7. A) CV of GCE-P(β -CD) in 7 consecutive days. B) Comparison of 7 consecutive days' peak current intensity for GCE-P(β -CD) versus time of storage (SD=1.74, n=4).

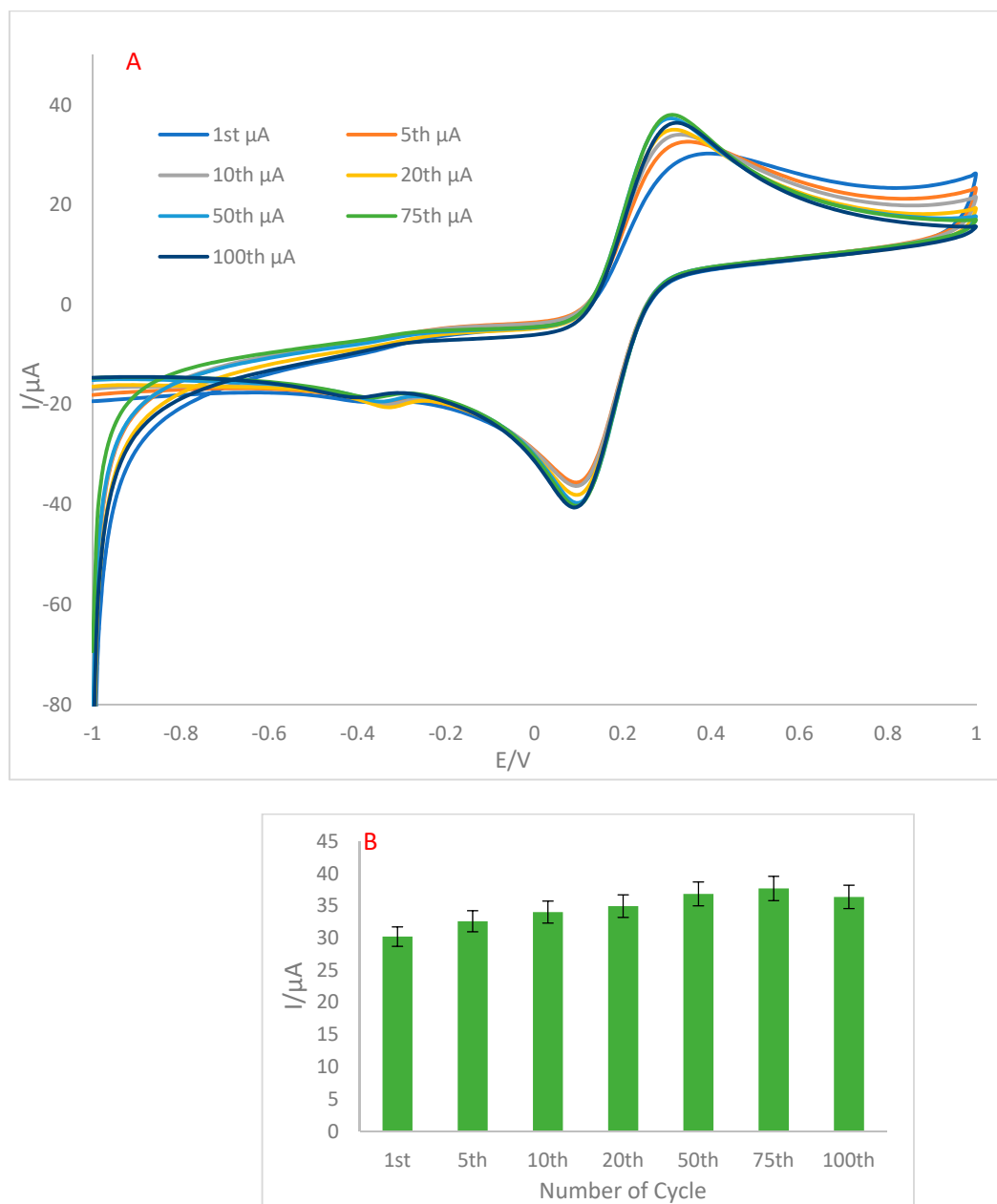


Figure S8. A) CV curves of GCE-P(β -CD) for the 1st, 5th, 10th, 20th, 50th, 75th, and 100th cycles.

B) Dependency of peak currents versus the number of cycles (SD=1.95, n=4).

Table S1. Electrochemical parameters of GCE-P(β -CD) and GCE (bare electrode).

DATA	GCE-P(β -CD)	GCE
α_n	0.59	0.33
D	$3.16 \times 10^{-5} \text{ cm}^2 \text{ s}^{-1}$	$1.17 \times 10^{-6} \text{ cm}^2 \text{ s}^{-1}$
A_{eas}	$9.05 \times 10^{-9} \text{ mol. cm}^{-2}$	$2.11 \times 10^{-10} \text{ mol. cm}^{-2}$
k_0	$8.8 \times 10^{+5} \text{ cm}^3 \text{ mol}^{-1} \text{ s}^{-1}$	$6.28 \times 10^{+4} \text{ cm}^3 \text{ mol}^{-1} \text{ s}^{-1}$

Table S2. Analytical parameters determined for calibration curves of α -Syn using engineered immunosensor.

Slop	Intercept	R ²	Linear range	LLOQ	Repeatability (RSD)	K _D ^a (nM)
0.0096	4.896	0.9836	0.02 to 64 ng/mL	0.02 ng/mL	1.49%	2.36

^a K_D dissociation constant of antigen-antibody complexes.