

Supporting information

Electrografting of 3-aminopropyltriethoxysilane on glassy carbon electrode for the improved adhesion of vertically oriented mesoporous silica thin films

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Cyclic voltammetry of ferrocene in acetonitrile

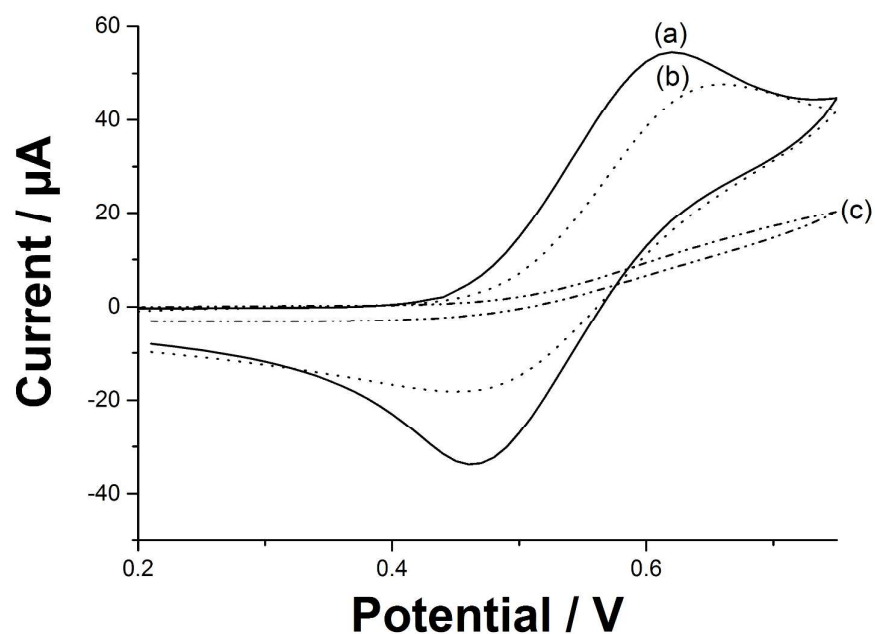


Figure S11: Cyclic voltammograms of 0.5 mM Ferrocene in 0.1 M $\text{Bu}_4\text{N}^+\text{BF}_4^-$ in acetonitrile at a bare glassy carbon electrode (a) and at a glassy carbon electrode modified by electrografting for 1 cycle (b) or 10 cycles (c) in 1 mM APTES in 0.1 M $\text{Bu}_4\text{N}^+\text{BF}_4^-$ in acetonitrile. $\nu = 100 \text{ mV s}^{-1}$.

XPS spectra

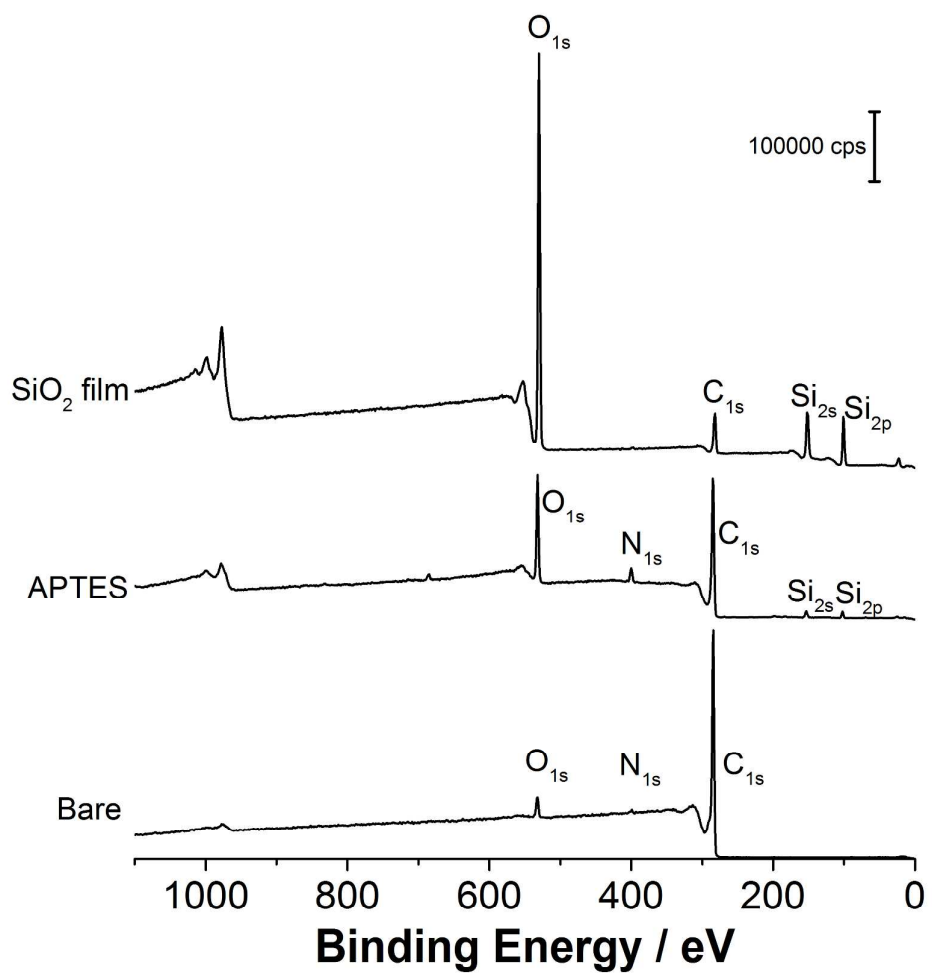


Figure S12: XPS spectra for the bare glassy carbon electrode, the electrode modified with APTES and the same electrode modified with a mesoporous silica film

Cyclic voltammetry of ferrocene dimethanol and hexacyanoferrate

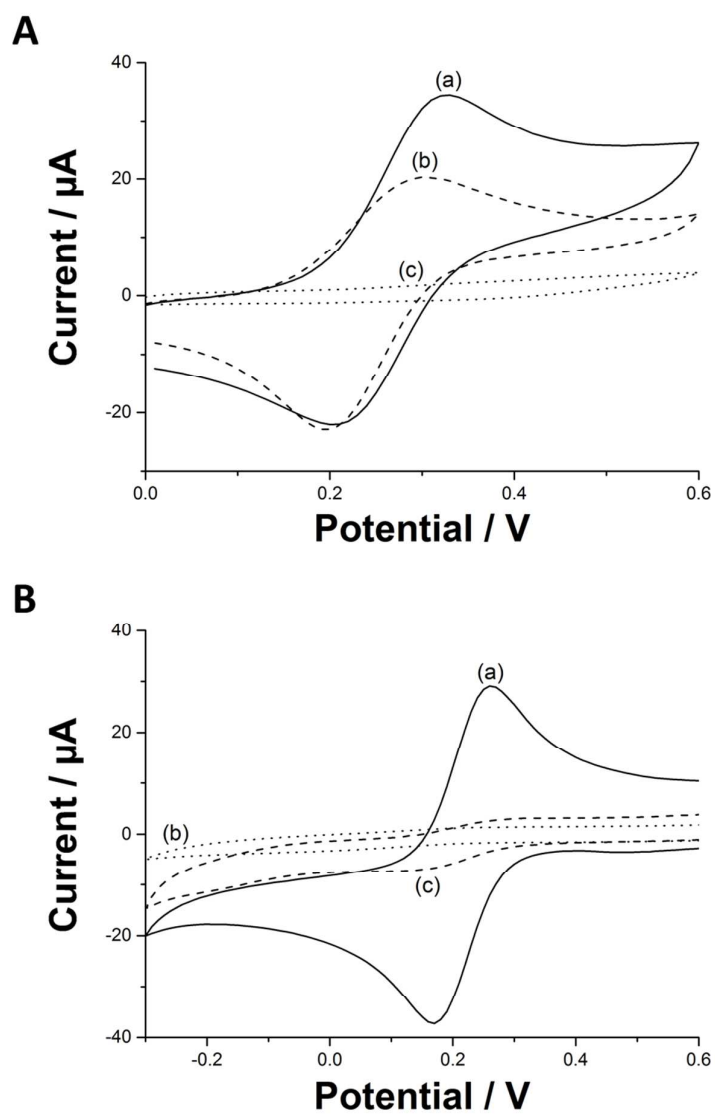


Figure S13: Cyclic voltammograms of 0.5 mM (A) Ferrocene dimethanol and (B) hexacyanoferrate in 0.1 M KCl at a glassy carbon electrode after (a) APTES electrografting and (b,c) mesoporous silica film formation, respectively (b) before and (c) after template extraction. $\nu = 100 \text{ mV s}^{-1}$.

Functionalisation of the mesoporous silica with click chemistry

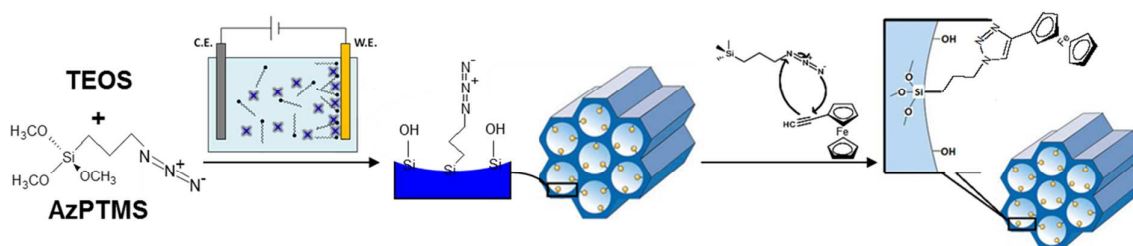


Figure SI4: Schematic representation of the combination of a 'click chemistry azide/alkyne' approach with electro-assisted self-assembly, which has been developed to get ferrocene-functionalized highly ordered and vertically-aligned mesoporous silica films,⁴⁴ and which was applied here to generate such thin films onto an APTES-modified glassy carbon electrode.

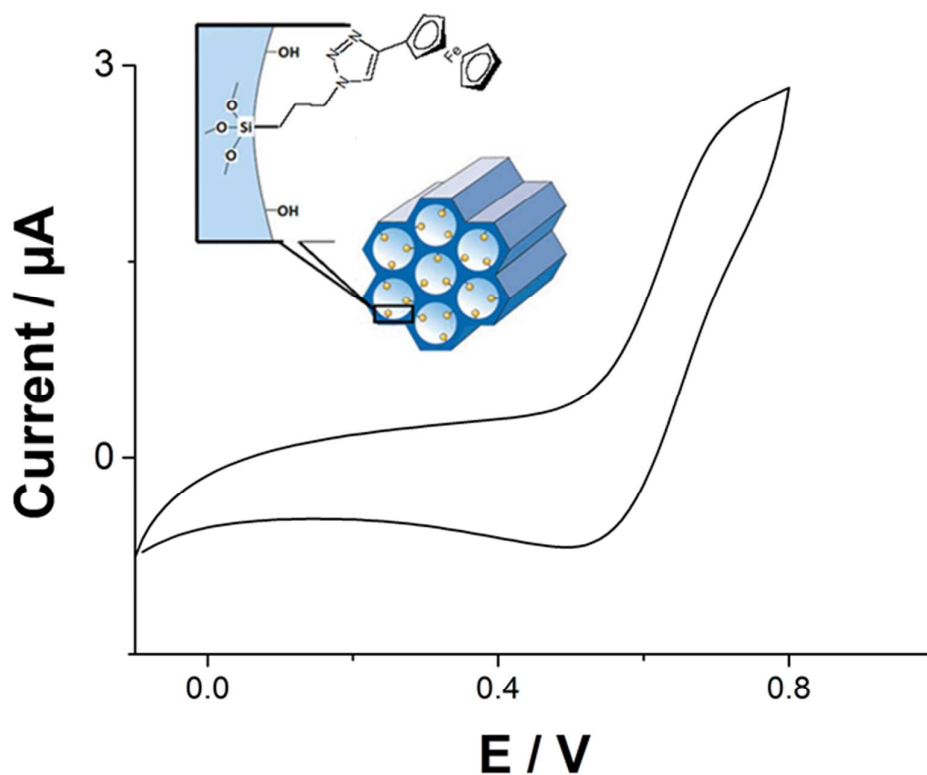


Figure SI5: CV of a glassy carbon electrode modified with a ferrocene-functionalized mesoporous silica thin film. The CV curve was recorded in 0.1 M $\text{Bu}_4\text{N}^+\text{TFB}_4^-$ in acetonitrile, $\nu = 20 \text{ mV s}^{-1}$. A silver wire was used as a pseudo-reference electrode and a stainless steel rod as a counter electrode.

Repetitive cycling of methylviologen at modified glassy carbon electrodes

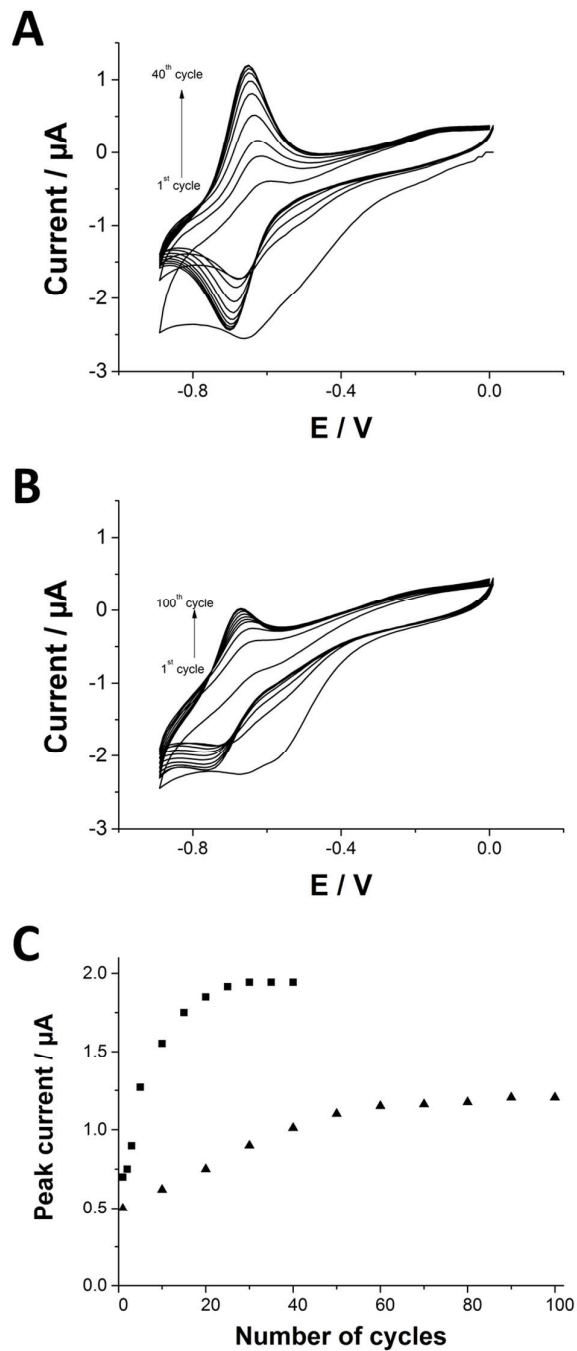


Figure SI6: (A-B) Repetitive CVs of (A) 5 μM and (B) 2 μM methylviologen in 0.1 M KCl at a glassy carbon electrode modified with mesoporous silica thin film anchored with an APTES layer. $v = 20 \text{ mV s}^{-1}$. (A) The CVs shown are the 1st, 2nd, 3rd, 5th, 10th, 15th, 20th, 25th, 30th, 35th and 40th. (B) The CVs shown are the 1st, 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th and 100th. (C) Reverse peak current as a function of the number of cycles for 5 μM (■) and 2 μM (▲) methylviologen.