Supporting Information

Oxide removal and stabilization of bismuth thin films through chemically bound thiol layers

Giuseppe Alessio Verni[†,+,§], Brenda Long[†,+,§], Farzan Gity[+],*

Martin Lanius[c], Peter Schüffelgen[c], Gregor Mussler[c], Detlev Grützmacher[c], Jim Greer[+‡]

and Justin D. Holmes[†, +, §]

[†]School of Chemistry, University College Cork, Cork, T12 P2FY, Ireland. [+]Tyndall National Institute, University College Cork, Cork, T12 PX46, Ireland. [§]AMBER@CRANN, Trinity College Dublin, Dublin 2, Ireland. [c]Peter Grünberg Institute 9 & Jülich Aachen Research Alliance (JARA-FIT), Research Center Jülich, Germany. [‡]Faculty of Science and Engineering, University of Nottingham Ningbo China, Ningbo, China

Table S1. Percentages of the elemental Bi and Bi-X components for the Bi *4f* core level XPS scans acquired on the samples

Sample	**Bi $4f_{5/2}$ Bi $4f_{7/2}$**	**BiX $4f_{5/2}$ BiX $4f_{7/2}$**
Wafer as rec.	23.5	76.5
Wafer + 1 mM thiol solution	28.0	72.0
Wafer + 10 mM thiol solution	59.1	40.9
Wafer + 100 mM thiol solution	64.9	35.1
Wafer + 100 mM thiol + air exp.	57.5	42.5
Powder as rec.	23.5	76.5
Powder + 100 mM	45.6	54.4

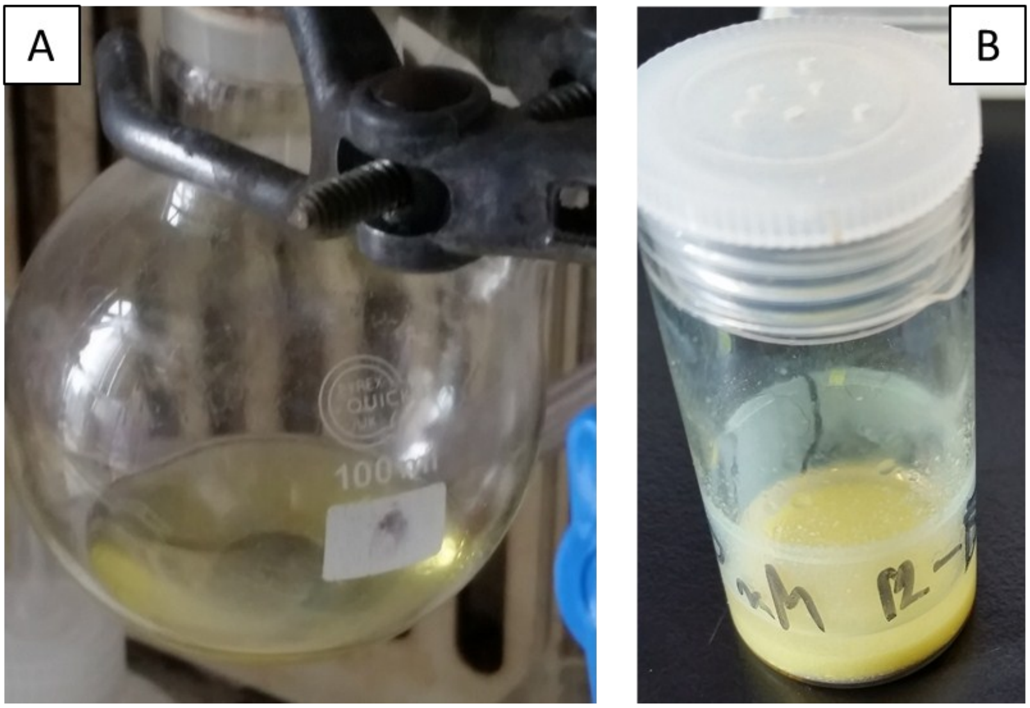

Figure S1. Pictures of (a) Flask under N_2 containing powder and a 100 mM solution of 1-dodecanethiol in IPA and (b) vial in air containing powder and 100 mM solution of 1-dodecanethiol in IPA. Note in both cases the colour of the solution turning yellow.

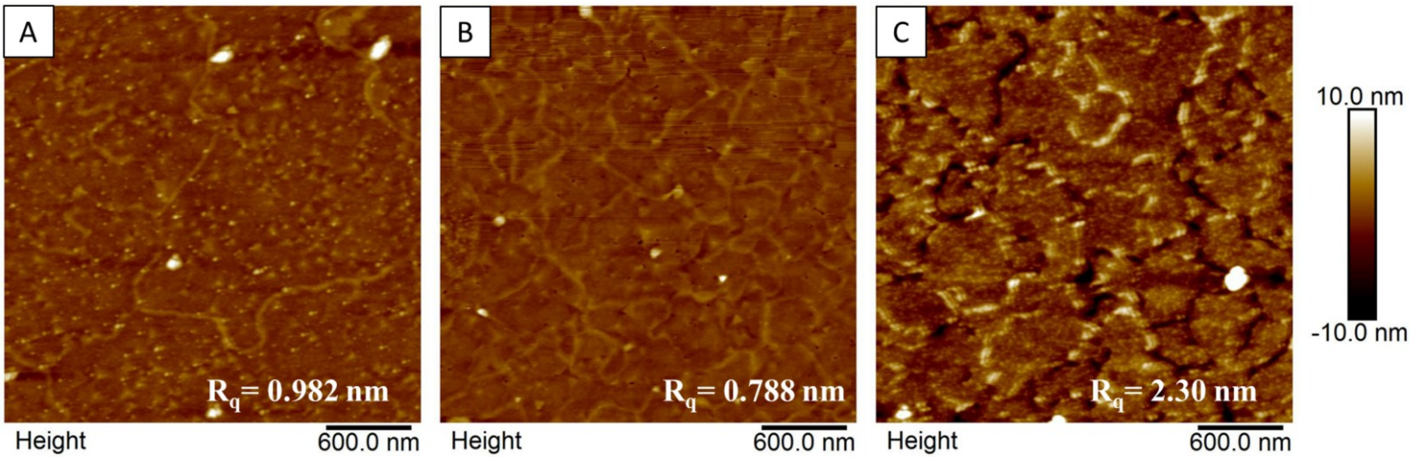

Figure S2. AFM images and RMS roughness values of (a) as received Bi film on Si, (b) Bi film after annealing at 180 °C for 3 hours, (c) annealed Bi surface after functionalisation with 1-dodecanethiol. Note in image (c) the non-continuity of the film which causes some areas of the wafer to reoxidise.

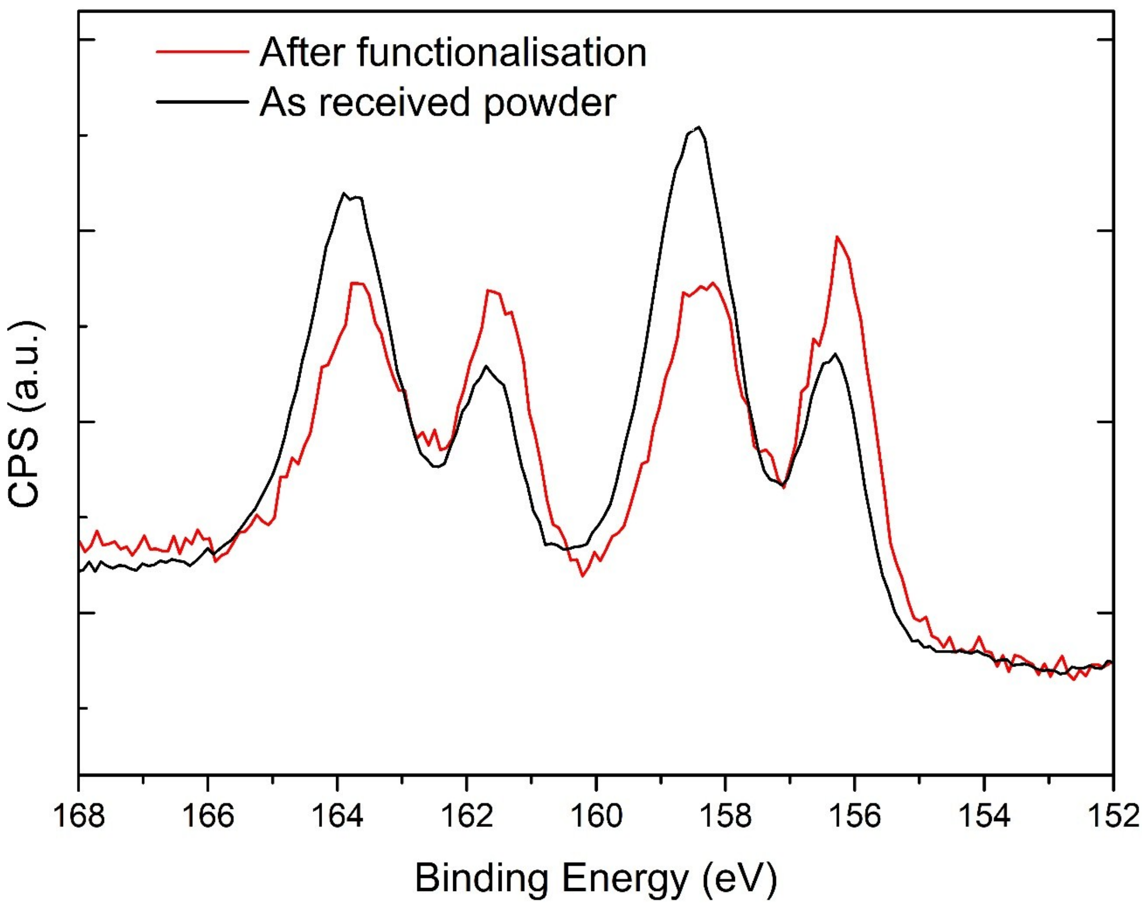

Figure S3. Overlaid XPS spectra of Bi *4f* core level of Bi powder before and after reaction with 1-dodecanethiol solution in IPA at 100 mM concentration. Graphs have been normalised to the minimum of the as received sample to underline the oxide reduction effect.