Supplementary Information

Low Temperature CVD Growth of PbS Films on Plastic Substrates

Javeed Akhtar, a# Mohammad Afzaal, b Mark A. Vincent, c Neil A. Burton, c Ian H. Hillier c and Paul O’Brien *a

a School of Chemistry and School of Materials, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK. Fax: (+44) 161 275 4616; Tel: (+44) 161 275 4652; E-mail: paul.obrien@manchester.ac.uk

b Center of Research Excellence in Renewable Energy, King Fahd University of Petroleum and Minerals, Dhahran, 31261 Saudi Arabia

c School of Chemistry, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

#Present address: Nanoscience and Materials Synthesis Laboratory, Department of Chemistry Quaid-i-Azam University, Islamabad, Pakistan.

Synthesis of \textit{bis}[\textit{O-butyldithiocarbonato}]\textit{lead} (1)

Initially NaH (0.6 g, 25 mmol) was added to a solution of butanol (2.3 ml, 25 mmol) in 30 mL of diethylether at room temperature and stirred for 30 min. Then CS\textsubscript{2} (1.5 ml, 25 mmol) was added dropwise and the solution further stirred for 10 min. Finally, Pb(NO\textsubscript{3})\textsubscript{2} (4.1 g, 12.5 mmol) dissolved in 15 mL of distilled water was added, yielding a white precipitate which was filtered and washed twice with water. Yield, 5.8 g (93 %). Anal. Calcd for C\textsubscript{10}H\textsubscript{18}S\textsubscript{4}O\textsubscript{2}Pb: C, 23.7; H, 3.5, S, 25.3, Pb, 40.9 % Found: C, 23.2; H, 3.4, S, 23.9, Pb, 41.8 %. IR cm\textsuperscript{-1}, 2803 \upsilon(C–H), 1070 \upsilon(C–S). \textsuperscript{1}H NMR (\textdelta, CDCl\textsubscript{3}, 400 MHz) 1 (t, CH\textsubscript{3}-R), 1.5 (m, CH\textsubscript{2}-CH\textsubscript{3}), 2.4( q, O-CH\textsubscript{2}CH\textsubscript{2}). 4.55 (t,O-CH\textsubscript{3}), MS: [C\textsubscript{4}H\textsubscript{9}COS]\textsuperscript{+} m/z, 117.
Physical Measurements:

TGA measurements were carried out by a Seiko SSC/S200 model with a heating rate of 10 °C min\(^{-1}\) under N\(_2\). X-ray powder diffraction studies were carried out by a Bruker AXS D8 diffractometer using monochromated Cu Kα radiation. Transmission electron microscope (TEM) samples were prepared by evaporating a dilute toluene solution of the nanoparticles on carbon coated copper grids (S166-3, Agar Scientific) and a Philips Technai Transmission Electron microscope was used to obtain TEM images of the nanoparticles. NMR spectra were carried out using a Bruker AC300 FT-NMR spectrometer. Mass spectra were recorded on a Kratos concept 1S instrument.
**Fig. S1.** TGA curve of [Pb(S$_2$COBu)$_2$] under N$_2$ (100 ml/min).
Fig. S2. PXRD of as-deposited PbS thin films at (a) 250 °C, (b) 200°C and (c) 150 °C on polyimide substrates.