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 *bis*[(O-butyldithiocarbonato)]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_2 (1.5 ml, 25 mmol) was added dropwise and the solution further stirred for 10 min. Finally, $Pb(NO_3)_2$ (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 $C_{10}H_{18}S_4O_2Pb$: 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^{-1}, 2803 υ(C–H), 1070 υ(C–S)**.** ^{1}H NMR (*δ*, $CDCl_3$, 400 MHz) 1 (t, CH_3-R), 1.5 (m, CH_2-CH_3), 2.4(q, O-CH_2CH_2). 4.55 (t,O-CH_3), MS: $[C_4H_9COS]^+$ 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.

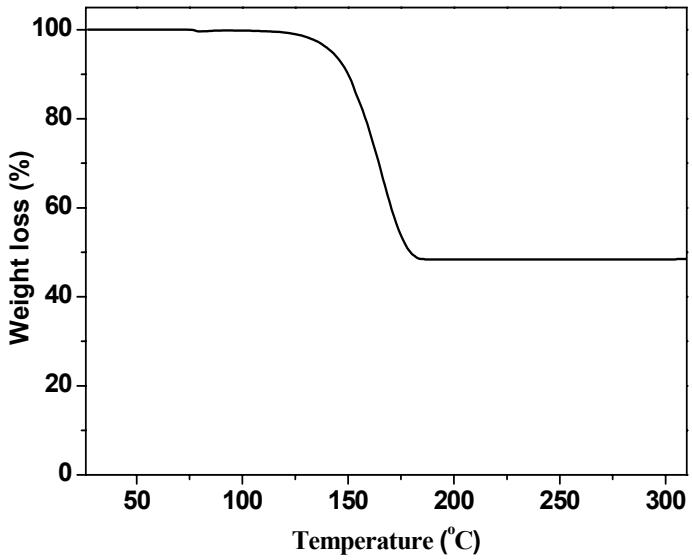

Fig. S1. TGA curve of $[Pb(S_2COBu)_2]$ under N_2 (100 ml/min).

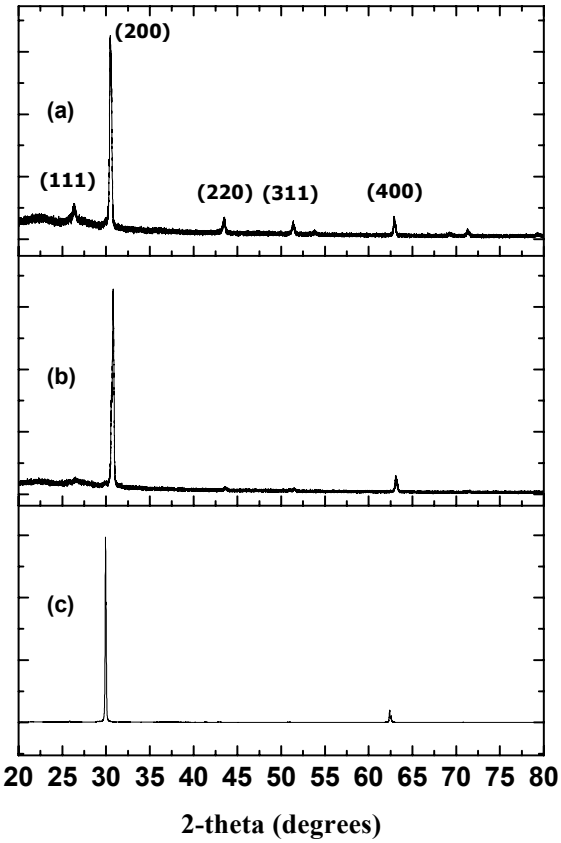

Fig. S2. PXRD of as-deposited PbS thin films at (a) 250 °C, (b) 200°C and (c) 150 °C on polyimide substrates.