Tin phosphide coatings from the atmospheric pressure chemical vapour deposition of $SnCl_4$ and $PCyc^{hex}_xH_{3-x}$.

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Atmospheric pressure chemical vapour deposition (APCVD) of tin phosphide thin films was achieved on glass substrates from the reaction of $SnCl_4$ or $SnBr_4$ with R_xPH_{3-x} (R = Cyc^{hex} or Phenyl) at 500 °C - 600 °C. These coatings show good uniformity and surface coverage. They are reasonably adherent, passing the Scotch tape test. The films were largely opaque in appearance with regions of birefringence. The films were x-ray amorphous. Scanning electron microscopy (SEM) showed surface morphologies consistent with an island growth mechanism. X-ray photoelectron spectroscopy (XPS) binding energy shifts for $SnP_{1.00}$ were 487.2 eV for Sn $3d_{5/2}$ and 133.6 eV for P $2p_{3/2}$. Energy dispersive X-ray analysis (EDXA) and electron probe studies gave elemental ratios that were in agreement indicating slightly tin rich and stoichiometric films, with negligible chlorine or bromine incorporation ($SnP_{1.33}$ – $SnP_{0.40}$). No Raman scattering was observed. Sheet resistance measurements indicated the films were insulating. Optically the films showed very poor reflectance (~2%) and 5-20% total transmission from 300 - 800 nm. Contact angle measurements were in the range 70 - 80 °, and showed little change after 60 minutes irradiation at 254 nm.