

Phosphinecarboxamide as an unexpected phosphorus precursor for the chemical vapour deposition of zinc phosphide thin films

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ABSTRACT:

This paper demonstrates the use of phosphinecarboxamide (PCA) as a facile phosphorus precursor, which can be used alongside zinc acetate for the chemical vapour deposition (CVD) of adherent and crystalline zinc phosphide films. Zinc phosphide thin films have a number of potential applications and PCA has a number of advantages over the highly toxic, corrosive and flammable phosphine used in previous CVD syntheses.

SUPPORTING INFORMATION

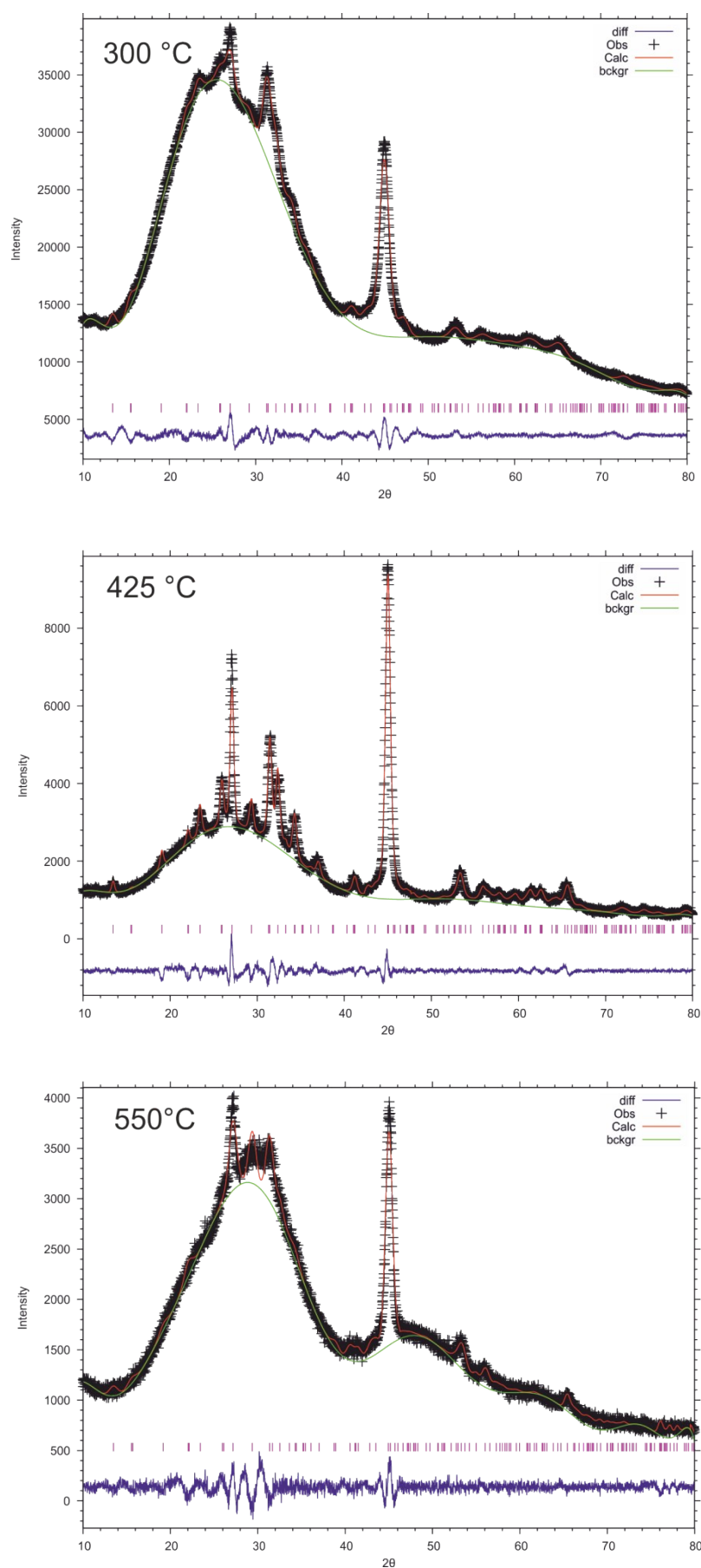


Figure S1. Rietveld refinement fits for the zinc phosphide (Zn_3P_2) films deposited at different temperatures.

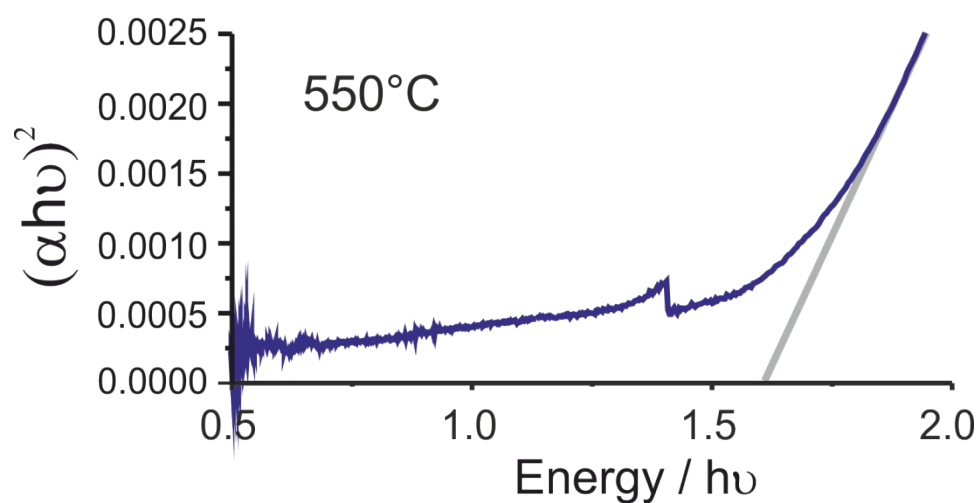
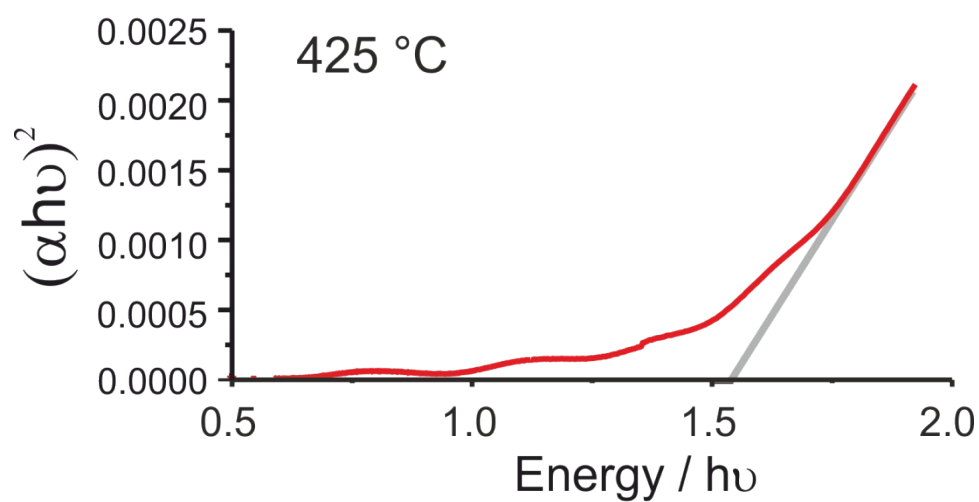
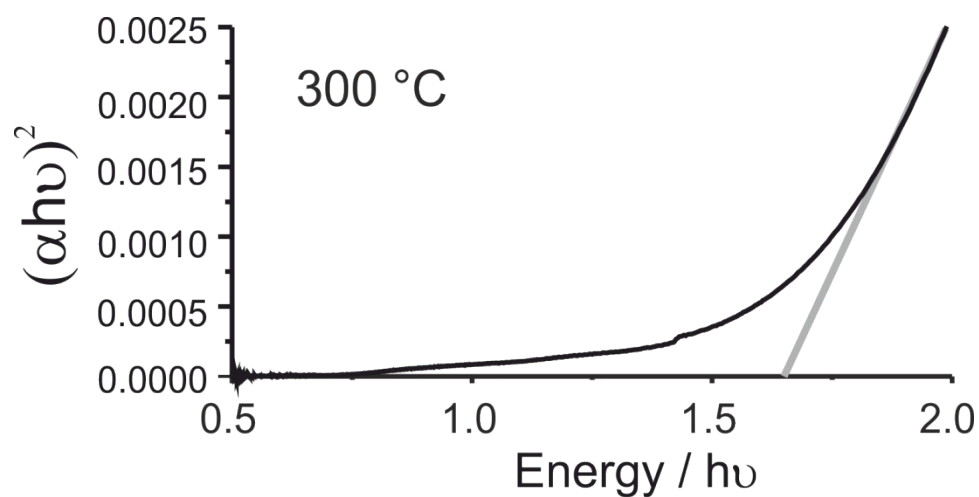
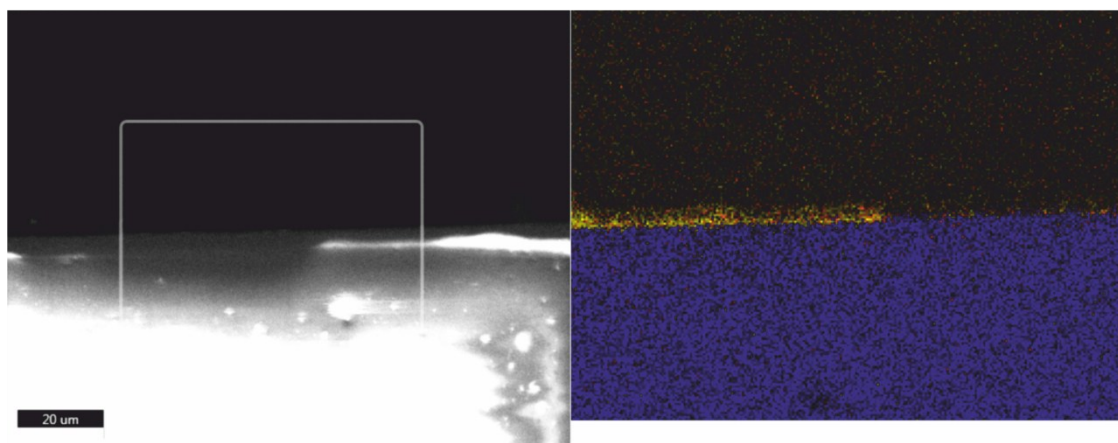
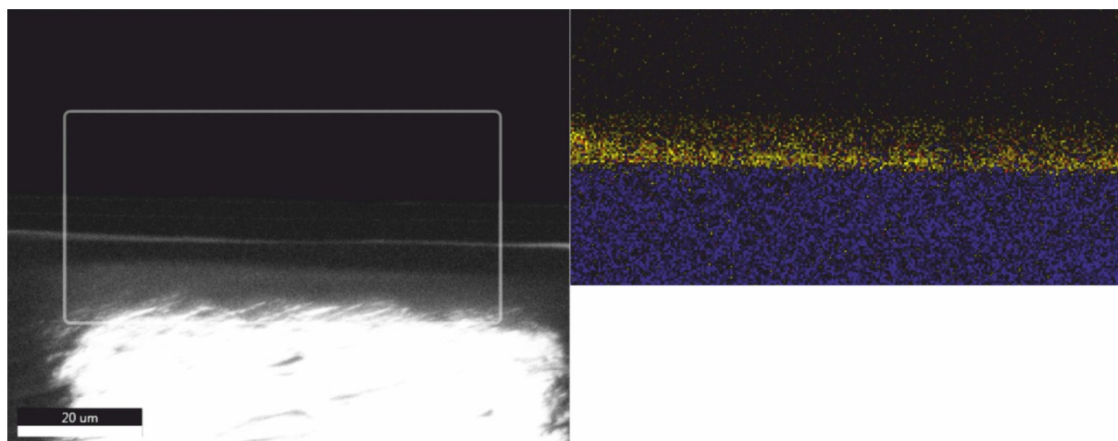


Figure S2. Tauc plots for Zn₃P₂ films deposited at different temperatures.

300°C



425°C



550°C

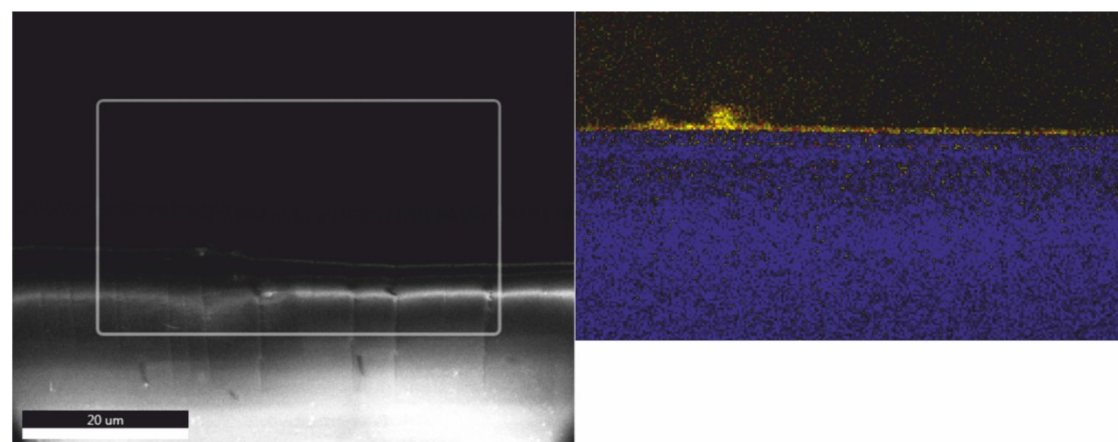


Figure S3. Side-on SEM images and EDX maps of the films deposited at different temperatures. The EDX maps show signals from oxygen K-lines as blue pixels, phosphorus K-lines as yellow pixels and zinc K-lines as red pixels.

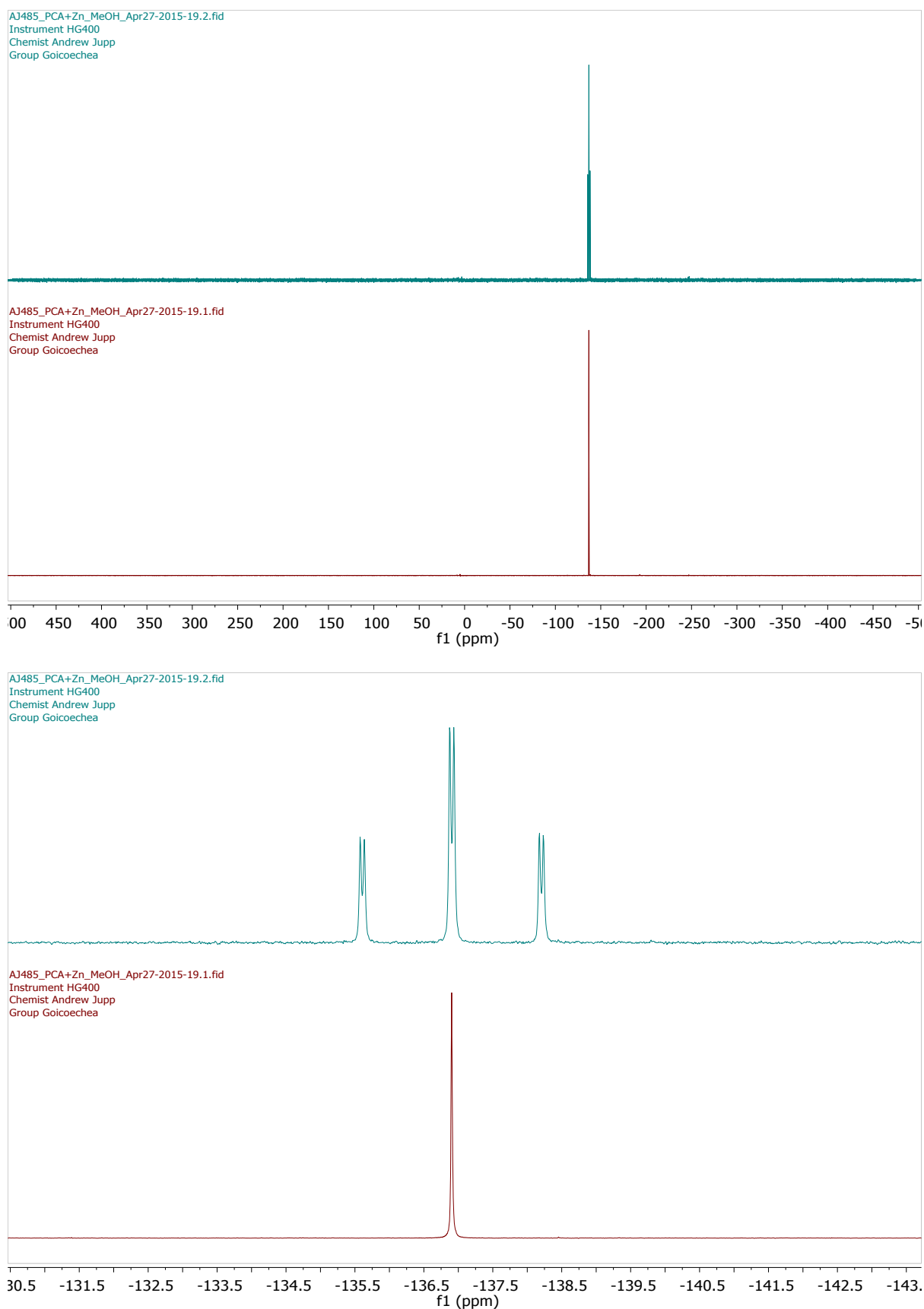


Figure S4. NMR data collected on zinc acetate (30 mmol) and phosphinecarboxamide (30 mmol) in methanol solution. Upper diagram shows large sweep width of ^{31}P NMR (top, blue) and $^{31}\text{P}\{^1\text{H}\}$ (bottom red). The lower figure shows the same spectra but scaled to show details of splitting patterns.