Abstract Submitted
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Crystalline ($Al_{1-x}B_x$)PSi_3 and ($Al_{1-x}B_x$)$AsSi_3$ tetrahedral phases via reaction of $Al(BH_4)_3$ and $M(SiH_3)_3$ (M=P, As)[1] PATRICK SIMS, ANDREW WHITE, TOSHIHIRO AOKI, JOSE MENENDEZ, JOHN KOUVETAKIS, Arizona State University — Crystalline ($Al_{1-x}B_x$)PSi_3 alloys (x = 0.04-0.06) are grown lattice-matched on Si(100) by reactions of P(SiH3)3 and Al(BH4)3 using low-pressure CVD. The materials have been characterized by ellipsometry, XRD, XTEM, EELS and EDS, indicating the formation of single-phase monocrystalline layers with tetrahedral structures based on $AlPSi_3$. The latter comprises interlinked $AlPSi_3$ tetrahedra in which Al-P pairs are isolated within a Si matrix. Raman scattering of $Al_{1-x}B_xPSi_3$ films support the presence of substitutional B in place of Al and provides evidence that B is bonded to P. The substitution of B atoms is desirable for promoting lattice matching, as required for Si-based solar cell designs. Analogous reactions of As(SiH3)3 with Al(BH4)3 produce ($Al_{1-x}B_x$)$AsSi_3$ in which the B incorporation is limited to doping concentrations at 10^{20} cm^{-3}. In both cases the Al(BH4)3 efficiently delivers Al to create crystalline group IV-III-V materials comprising light, earth abundant elements with possible application in photovoltaics and light element refractory solids.

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