Electronic Supplementary Information

Tin-Catalyzed Hydrophosphination of Alkenes

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Figures S1 – S26: Hydrophosphination reactions ran with Cp_2SnCl_2 under a hydrogen atmosphere.

Figures S27 – S28: Hydrophosphination reactions ran with Cp*₂SnCl₂ under a nitrogen atmosphere.

Figures S29 – S36: Hydrophosphination reactions ran with Ph₂SnCl₂ under a hydrogen atmosphere.

Figures S37 – S38: Hydrophosphination reactions ran with Ph₂SnCl₂ under a nitrogen atmosphere.

Figures S39 – S44: Hydrophosphination reactions ran with Cp*₂Sn under a nitrogen atmosphere.

Figures S45 – S47: Dehydrocoupling reactions with Cp*₂SnCl₂, Ph₂SnCl₂, and Cp*₂Sn.

Figures S48 – S49: Stoichemetric reaction with Ph_2PH and 2-vinyl pyridine under a hydrogen atmosphere.

Figures S50 – S51: GCMS spectra.

Figures S52 – S567: Hydrophosphination reactions ran with $B(C_6F_5)_3$ under a nitrogen atmosphere at 100° C.

Figures S68 – S69: Competitive hydrophosphination reaction ran with Cp^{*}₂SnCl₂, Ph₂PH, Ph₂PD, Styrene, under a hydrogen atmosphere.

Figures S70 – S85: Hydrophosphination reactions ran with under a nitrogen atmosphere at 100° C.



Figure S1: Cp*₂SnCl₂ + Ph₂PH + Vinyl Pyridine, ³¹P NMR spectrum, final

Figure S2: $Cp_2SnCl_2 + Ph_2PH + Vinyl Pyridine$, ³¹P{¹H} NMR spectrum, final





Figure S3: Cp*₂SnCl₂ + Ph₂PH + 2-Vinyl Pyridine, ¹H NMR spectrum, final

Figure S4: Cp*₂SnCl₂ + Ph₂PH + acrylonitrile, ³¹P NMR spectrum, final





Figure S5: Cp*2SnCl2 + Ph2PH + acrylonitrile, ¹H NMR spectrum, final

Figure S6: $Cp_{2}^{*}SnCl_{2} + Ph_{2}PH + 4$ -bromo styrene, ³¹P NMR spectrum, final





Figure S7: $Cp_2SnCl_2 + Ph_2PH + 4$ -bromo styrene, ³¹P{¹H} NMR spectrum, final

Figure S8: $Cp_{2}^{*}Sn Cl_{2} + Ph_{2}PH + 4$ -bromo styrene, ¹H NMR spectrum, final





Figure S9: $Cp_2SnCl_2 + Ph_2PH + ethyl acrylate$, ³¹P NMR spectrum, final

Figure S10: Cp*₂SnCl₂ + Ph₂PH + ethyl acrylate, ³¹P{¹H} NMR spectrum, final





Figure S11: Cp*₂Sn Cl₂ + Ph₂PH + ethyl acylate, ¹H NMR spectrum, final

Figure S12: Cp*₂SnCl₂ + Ph₂PH + 4-trifluromethyl styrene, ³¹P NMR spectrum, final





Figure S13: Cp*₂SnCl₂ + Ph₂PH + 4-trifluromethyl styrene, ³¹P{¹H} NMR spectrum, final

Figure S14: Cp*₂Sn Cl₂ + Ph₂PH + 4-trifluromethyl styrene, ¹H NMR spectrum, final





Figure S15: Cp*₂SnCl₂ + Ph₂PH + 4-methyl styrene, ³¹P NMR spectrum, final

Figure S16: $Cp_{2}^{*}SnCl_{2} + Ph_{2}PH + 4$ -methyl styrene, ³¹P{¹H} NMR spectrum, final





Figure S17: Cp*₂Sn Cl₂ + Ph₂PH + 4-methyl styrene, ¹H NMR spectrum, final

Figure S18: Cp*₂SnCl₂ + Ph₂PH + phenyl acetylene, ³¹P NMR spectrum, final





Figure S19: Cp*₂SnCl₂ + Ph₂PH + phenyl acetylene, ³¹P{¹H} NMR spectrum, final

Figure S20: Cp*₂Sn Cl₂ + Ph₂PH + phenyl acetylene, ¹H NMR spectrum, final





Figure S21: Cp*₂SnCl₂ + Ph₂PH + styrene, ³¹P NMR spectrum, final

Figure S22: Cp $^{*}_{2}$ SnCl₂ + Ph₂PH + styrene, 31 P{ 1 H} NMR spectrum, final





Figure S23: Cp*₂Sn Cl₂ + Ph₂PH + styrene, ¹H NMR spectrum, final

Figure S24: Cp*₂SnCl₂ + Ph₂PH + vinyl ethyl ether, ³¹P NMR spectrum, final





Figure S25: $Cp_2SnCl_2 + Ph_2PH + vinyl ethyl ether$, ³¹P{¹H} NMR spectrum, final

Figure S26: Cp*₂Sn Cl₂ + Ph₂PH + vinyl ethyl ether, ¹H NMR spectrum, final





Figure S27: Cp*₂SnCl₂ + Ph₂PH + styrene, ³¹P NMR spectrum, final

Figure S28: Cp*₂Sn Cl₂ + Ph₂PH + styrene, ¹H NMR spectrum, final





Figure S29: Ph₂SnCl₂ + Ph₂PH + acrylonitrile, ³¹P NMR spectrum, final

Figure S30: Ph₂Sn Cl₂ + Ph₂PH + acrylonitrile, ¹H NMR spectrum, final





Figure S31: Ph₂SnCl₂ + Ph₂PH + ethyl acrylate, ³¹P NMR spectrum, final

Figure S32: Ph₂Sn Cl₂ + Ph₂PH + ethyl acrylate, ¹H NMR spectrum, final





Figure S33: Ph₂SnCl₂ + Ph₂PH + vinyl ethyl ether, ³¹P NMR spectrum, final

Figure S34: Ph₂Sn Cl₂ + Ph₂PH + vinyl ethyl ether, ¹H NMR spectrum, final





Figure S35: Ph₂SnCl₂ + Ph₂PH + 2-vinyl pyridine, ³¹P NMR spectrum, final

Figure S36: Ph₂Sn Cl₂ + Ph₂PH + 2-vinyl pyridine, ¹H NMR spectrum, final





Figure S37: Ph₂SnCl₂ + Ph₂PH + 2-vinyl pyridine, ³¹P NMR spectrum, final

Figure S38: Ph₂Sn Cl₂ + Ph₂PH + 2-vinyl pyridine, ¹H NMR spectrum, final





Figure S39: Cp*₂Sn + Ph₂PH + acrylonitrile, ³¹P NMR spectrum, final

Figure S40: Cp*₂Sn + Ph₂PH + acrylonitrile, ¹H NMR spectrum, final





Figure S41: Cp*₂Sn + Ph₂PH + styrene, ³¹P NMR spectrum, final

Figure S42: Cp*₂Sn + Ph₂PH + styrene, ¹H NMR spectrum, final





Figure S43: Cp*₂Sn + Ph₂PH + 2-vinyl pyridine, ³¹P NMR spectrum, final

Figure S44: Cp*₂Sn + Ph₂PH + 2-vinyl pyridine, ¹H NMR spectrum, final





Figure S45: $Cp_{2}^{*}Sn + Ph_{2}PH$, ³¹P NMR spectrum, final

Figure S46: Cp*₂SnCl₂ + Ph₂PH, ³¹P NMR spectrum, final





Figure S47: Ph₂SnCl₂ + Ph₂PH, ³¹P NMR spectrum, final

Figure S48: Ph₂PH + 2-vinyl pyridine, ³¹P NMR spectrum, final





Figure S49: Ph₂PH + 2-vinyl pyridine, ¹H NMR spectrum, final

Figure S50: GC – MS (EI) of (4-bromophenylethyl) diphenylphosphine



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Figure S51: GC – MS (EI) of (4-trifluromethylphenylethyl) diphenylphosphine



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Figure S52: $B(C_6F_5)_3 + Ph_2PH + styrene + N_2 at 65 °C for 18 hours, {}^{31}P NMR, final$

Figure S53: $B(C_6F_5)_3 + Ph_2PH + styrene + N_2 at 100 °C for 20 hours, ³¹P NMR, final$





Figure S54: $B(C_6F_5)_3 + Ph_2PH + 4$ -bromo styrene + N_2 at 100 °C for 18 hours, ³¹P NMR, final

Figure S55: B(C₆F₅)₃ + Ph₂PH + 4-Bromo Styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S56: $B(C_6F_5)_3 + Ph_2PH + 4$ -methyl styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S57: $B(C_6F_5)_3 + Ph_2PH + 4$ -methyl styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S58: B(C₆F₅)₃ + Ph₂PH + 4-trifluromethyl styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S59: B(C₆F₅)₃ + Ph₂PH + 4-trifluromethyl styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S60: $B(C_6F_5)_3 + Ph_2PH + acrylonitrile + N_2 at 100 °C for 18 hours, ³¹P NMR, final$

Figure S61: $B(C_6F_5)_3 + Ph_2PH + acrylonitrile + N_2 at 100 °C for 18 hours, ¹H NMR, final$





Figure S62: B(C₆F₅)₃ + Ph₂PH + 2-vinyl pyridine + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S63: B(C₆F₅)₃ + Ph₂PH + 2-vinyl pyridine + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S64: $B(C_6F_5)_3 + Ph_2PH + vinyl ethyl ether + N_2 at 100 °C for 18 hours, ³¹P NMR, final$

Figure S65: B(C₆F₅)₃ + Ph₂PH + vinyl ethyl ether + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S66: $B(C_6F_5)_3 + Ph_2PH + ethyl acrylate + N_2 at 100 °C for 18 hours, ³¹P NMR, final$







Figure S68: Cp^{*}₂SnCl₂ + Ph₂PH + Ph₂PD + Styrene + H₂, ³¹P NMR, final

Figure S69: Cp^{*}₂SnCl₂ + Ph₂PH + Ph₂PD + Styrene + H₂, ¹H NMR, final





Figure S70: Ph₂PH + styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S71: Ph₂PH + styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S72: Ph₂PH + 4-bromo styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S73: Ph₂PH + 4-Bromo Styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S74: Ph₂PH + 4-methyl styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S75: Ph₂PH + 4-methyl styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S76: Ph₂PH + 4-trifluromethyl styrene + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S77: Ph₂PH + 4-trifluromethyl styrene + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S78: Ph₂PH + acrylonitrile + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S79: Ph₂PH + acrylonitrile + N₂ at 100 $^{\circ}$ C for 18 hours, ¹H NMR, final





Figure S80: Ph₂PH + 2-vinyl pyridine + N₂ at 100 $^{\circ}$ C for 18 hours, ³¹P NMR, final

Figure S81: Ph₂PH + 2-vinyl pyridine + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S82: Ph₂PH + vinyl ethyl ether + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S83: Ph₂PH + vinyl ethyl ether + N₂ at 100 °C for 18 hours, ¹H NMR, final





Figure S84: Ph₂PH + ethyl acrylate + N₂ at 100 °C for 18 hours, ³¹P NMR, final

Figure S85: Ph₂PH + ethyl acrylate + N₂ at 100 °C for 18 hours, ¹H NMR,

