Supplementary Material

β-Pinene and camphor based, pyrazole-tethered triarylphosphines as chiral P,N ligands for palladium

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X-ray crystal structure of ligand (C3) (Figure 1).

Figure 1: Thermal ellipsoid plot of Pd-L3 (C3) complex drawn at 50 % probability level.

Crystal data of Pd-L1 complex (C3): A colorless block shaped crystal (0.28 X 0.19 X 0.08 mm) was analyzed. Empirical formula C30H28Cl₂F₃N₂Pd, FW = 681.81, monoclinic space group P2₁, a = 8.8797(7)Å, b = 15.9122(12)Å, c = 11.4502(9)Å, β = 102.348(2)°, V = 1580.4(2) Å³, T = 150 K, Z = 2. ρcalcd = 1.433 g cm⁻³. F (000) = 688, λ (Mo–Kα) = 0.71073 Å, μMoKα /mm⁻¹ = 0.846, 2θmax = 50.0°, 15013 total reflections, 5237 unique reflections, 5001 observed (I>2σ (I)) 355 parameters; Rint= 0.0327, R₁ = 0.0322; wR₂ = 0.0762 (I>2σ (I)), R₁ = 0.0338; wR₂ = 0.0771 (all data) with GOF = 1.016.
Spectrum of all compounds
31P NMR Spectrum
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$^{31}$P NMR Spectrum

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**31P NMR Spectrum**

![31P NMR Spectrum](image)

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**31P NMR Spectrum**

![31P NMR Spectrum](image)
$^{19}$F NMR Spectrum
$^{19}$F NMR Spectrum:
$^{31}$P NMR Spectrum