

ORIGINAL PAPER

Mercury(II) complexes of new bidentate phosphorus ylides:
synthesis, spectra and crystal structures

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Received 6 April 2013; Revised 28 July 2013; Accepted 9 August 2013

The reaction of dpmp (1,1-bis(diphenylphosphino)methane) with 2-bromo-4-phenylacetophenone and benzyl bromoacetate in chloroform produces new phosphonium salts, $[\text{Ph}_2\text{PCH}_2\text{PPh}_2\text{CH}_2\text{C}(\text{O})\text{C}_6\text{H}_4\text{Ph}]\text{Br}$ (*I*) and $[\text{Ph}_2\text{PCH}_2\text{PPh}_2\text{CH}_2\text{COOCH}_2\text{Ph}]\text{Br}$ (*II*). By allowing the phosphonium salts to react with the appropriate base, the bidentate phosphorus ylides, $\text{Ph}_2\text{PCH}_2\text{PPh}_2=\text{C}(\text{H})\text{C}(\text{O})\text{C}_6\text{H}_4\text{Ph}$ (*III*) and $\text{Ph}_2\text{PCH}_2\text{PPh}_2=\text{C}(\text{H})\text{C}(\text{O})\text{OCH}_2\text{Ph}$ (*IV*), were obtained. The reaction of these ligands with mercury(II) halides in dry methanol led to the formation of the mononuclear complexes $\{\text{HgX}_2[(\text{Ph}_2\text{PCH}_2\text{PPh}_2\text{C}(\text{H})\text{C}(\text{O})\text{C}_6\text{H}_4\text{Ph})]\}$ ($\text{X} = \text{Cl}$ (*V*); $\text{X} = \text{Br}$ (*VI*); $\text{X} = \text{I}$ (*VII*)) and $\{\text{HgX}_2[(\text{Ph}_2\text{PCH}_2\text{PPh}_2\text{C}(\text{H})\text{COOCH}_2\text{Ph})]\}$ ($\text{X} = \text{Cl}$ (*VIII*); $\text{X} = \text{Br}$ (*IX*); $\text{X} = \text{I}$ (*X*)). The FTIR and ^1H , ^{31}P and ^{13}C NMR spectra were studied. The structure of compound *III* was unequivocally determined by the single-crystal X-ray diffraction technique. Single-crystal X-ray analysis of the $\{\text{HgBr}_2[(\text{Ph}_2\text{PCH}_2\text{PPh}_2\text{C}(\text{H})\text{C}(\text{O})\text{C}_6\text{H}_4\text{Me})]\}$ complex (*XI*) revealed the presence of a mononuclear complex containing the Hg atom in a distorted tetrahedral environment. In all complexes, the ylides referred to above were coordinated through the ylidic carbon and the phosphine atom.

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Keywords: unsymmetrical phosphorus ylides, Hg(II) complexes, X-ray crystal structure

Introduction

Multi-functional ligands are organic entities that possess more than one functional group; these ligands have attracted interest due to the wide field of applications based on their multi-functionality (Navarro & Urriolabeitia, 1999). Phosphorus ylides are remarkable and important ligands that have attracted much attention in the synthetic, catalytic and theoretical fields of transition metal chemistry (Johnson, 1993; Sabounchei et al., 2013a). These compounds are very interesting ligands in organometallic chemistry, as well as being useful intermediates in organic synthesis (Kokotos & Aggarwal, 2007; Heinicke et al., 2005; Janardanan & Sunoj, 2007; Kolodiazny, 1997; Hey-

dari et al., 2010). Transition metal complexes of these ligands have attracted much attention due to their versatile coordination chemistry and their application in catalysis (Abu-Gnim & Amer, 1996; Grushin, 2004; Wegman et al., 1987). Much of the interest in the coordination properties of resonance-stabilised phosphorus ylides stems from their ligating versatility due to the presence of different functional groups in their molecular skeleton (Ebrahim et al., 2009; Urriolabeitia, 2008; Falvello et al., 2001; Vicente et al., 2002; Viau et al., 2001). Hence, it is clear that these ligands can engage in different kinds of bonding with different metal ions (Falvello et al., 2000, 2003; Sbovata et al., 2008; Sabounchei et al., 2010a; Oosawa et al., 1976; Lin et al., 1990; Ebrahim et al.,

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