

# SYNTHESIS OF MOLECULAR PHOSPHONATES IN APROTIC SOLVENTS

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The transition metals complexes with the organophosphonate ligands of the general formula  $[RPO_3]^{2-}$  are much less studied compared to the carboxyl and similar compounds.<sup>1</sup> This is partly due to their coordination capabilities that allow the formation of multidentate insoluble complexes. Indeed, there are a large number of compounds with a multidimensional structure, such as coordination polymers (1D), layered structures (2D) and columnar or tubular (3D), however soluble molecular phosphonates (0D) are less known. The third group of periodic table is one of the less explored groups of elements. Although their well characterized phosphonic compounds have been prepared, they are not numerous.<sup>2</sup> Therefore, a series of experiments was conducted with selected phosphonic acids and their silylated esters with anhydrous transition metal chlorides in an aprotic solvent environment such as THF and pyridine. The obtained products were studied by multinuclear NMR spectroscopy and in cases of successful crystal isolation by SCXRD. From the the reactions of *tert*-butyl phosphonic acid with yttrium(III) and lanthanum(III) it is  $[\mu_3\text{-}^t\text{BuP(O)}_3]_4(\text{YClpy})_2(\text{YCl}_2\text{pyH})_2$  in pseudo-cubane geometry with  $[\text{Hpy}]_3[\text{YCl}_6]\cdot 2\text{py}$  as a byproduct and  $\text{La}_4[\mu_6\text{-}^t\text{BuP(O)}_3]_2[\mu_4\text{-}^t\text{BuPO}_2(\text{OH})]_2(\mu_2\text{-Cl})_2\text{Cl}_8(\text{Hpy})_6$  with bridged-square geometry.<sup>3,4</sup> Reactions of other transition metals were studied as well. Reaction of anhydrous  $\text{CuCl}_2$  with  $\text{PhPO}_3\text{H}_2$  and  $\text{KO}^t\text{Bu}$  in dry pyridine yielded two products. A product with formula  $[\text{Cu}_6(\mu_3\text{-PhPO}_3)_4(\mu_4\text{-PO}_4)\cdot 12\text{py}]\text{Cl}$  with adamantane-like structure and  $(\text{Cupy})_6(\mu_3\text{-PhPO}_3)_4(\mu_4\text{-PhPO}_3)_2$  with cluster geometry. Reaction of salicylphosphonic acid ( $\text{salPO}_3\text{H}_2$ ) with  $\text{CuCl}_2$  and  $\text{KO}^t\text{Bu}$  in dry pyridine produced 1D product  $[\text{Cupy}_4(\text{salPOH}_2)_2]_n$ .

## References

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