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Review

Polyoxometalates containing late transition and noble metal atoms

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Abbreviations: POM, polyoxometalate; Me, methyl; Et, ethyl; Bu, butyl; MeCN, acetonitrile; DMF, dimethylformamide; DMSO, dimethyl sulfoxide; COD, 1,5-cyclooctadiene; *p*-cym, *para*-cymene; Cp*, C_5Me_5; Cp, C_5H_5; OAc, CH_3COO^-; Bipym, bipyrimidyl; bipy, bipyridine; py, pyridine; 4atrz, 4-amino-1,2,4-triazole; trz, 1,2,4-triazole; 3atrz, 3-amino-1,2,4-triazole; tpyprz, tetra-2-pyridylpyrazine; Hfcz, fluconazole-[2-(2,4-difluorophenyl)-1,3-di(1*H*-1,2,4-triazol-1-yl)propan-2-ol]; phen, 1,10-phenanthroline; bhep, N,N′-bis(2-hydroxyethyl)piperazine; bppy, 5-(4-bromophenyl)-2-(4-pyridinyl)pyridine; dafo, 4,5-diazafluoren-9-one; nct, nicotinate; pz, pyrazine; phnz, phenazine.

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ABSTRACT

This review describes the state of the art in the field of polyoxometalates containing noble metal atoms (ruthenium, rhodium, palladium, silver, osmium, iridium, platinum and gold). The structures of the various species are listed together with their applications (mainly in catalysis).

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1. Introduction

Polyoxometalates have been known since the beginning of the XIXth century as it is generally admitted that the first compound of this class (the ammonium salt of $PMo_{12}O_{40}^{3-}$) was discovered by Berzelius in 1826 [1]. The first structural determination of the phosphotungstic anion was made by Keggin in 1934 [2] and during many years these compounds remained only laboratory curiosities. It is only at the end of the nineteen seventies that catalytic studies by many groups around the world put them in the light and now their applications have exploded in various domains such as analysis, biochemistry, non linear optics without omitting catalysis (see for example [3–19]).

From a structural point of view, the polyoxometalates can be considered as aggregates, generally anionic, with a structure

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