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Synthesis, characterization and catalytic activities of rhenium carbonyl complexes bearing pyridine-alkoxide ligands

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Abstract

Thermal treatment of $\text{Re}_2(\text{CO})_{10}$ with pyridine-alkoxide ligands $\text{PyC}(\text{CH}_2)_4\text{OH}$ (**L_aH**) and $\text{PyCR}^1\text{R}^2\text{OH}$ ($\text{R}^1 = \text{CH}_3$, $\text{R}^2 = \text{C}_6\text{H}_5$ (**L_bH**); $\text{R}^1 = \text{H}$, $\text{R}^2 = \text{C}_6\text{H}_5$ (**L_cH**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-CH}_3\text{C}_6\text{H}_4$ (**L_dH**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-OMeC}_6\text{H}_4$ (**L_eH**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-ClC}_6\text{H}_4$ (**L_fH**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-CF}_3\text{C}_6\text{H}_4$ (**L_gH**)) respectively in refluxing xylene generated a series of dirhenium carbonyl complexes $[\text{PyC}(\text{CH}_2)_4\text{O}]_2[\text{Re}(\text{CO})_3]_2$ (**1a**) and $(\text{PyCR}^1\text{R}^2\text{O})_2[\text{Re}(\text{CO})_3]_2$ ($\text{R}^1 = \text{CH}_3$, $\text{R}^2 = \text{C}_6\text{H}_5$ (**1b**); $\text{R}^1 = \text{H}$, $\text{R}^2 = \text{C}_6\text{H}_5$ (**1c**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-CH}_3\text{C}_6\text{H}_4$ (**1d**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-OMeC}_6\text{H}_4$ (**1e**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-ClC}_6\text{H}_4$ (**1f**); $\text{R}^1 = \text{H}$, $\text{R}^2 = 4\text{-CF}_3\text{C}_6\text{H}_4$ (**1g**)). Complexes **1a–1g** were characterized by NMR spectroscopy, elemental analyses and FT-IR spectroscopy. Furthermore, the molecular structures of complexes **1a**, **1d** and **1g** were determined by single crystal X-ray diffraction analysis. In the presence of TEMPO (2,2,6,6-tetramethyl-1-piperidinyloxy) as co-oxidant and molecular oxygen (ambient air) as terminal oxidant, these dirhenium carbonyl complexes showed moderate catalytic activity for aerobic oxidation of secondary alcohols.

Keywords: rhenium carbonyl complexes, pyridine-alkoxide ligand, aerobic oxidation, secondary alcohol.

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