# Complexes with heterocyclic nitrogen ligands - III. Cationic rhodium(I) derivatives and applications in catalysis

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The preparation and spectroscopic properties of mononuclear cationic complexes of rhodium(I) coordinated to the diolefin 2,5-norbornadiene (NBD) and to the heterocyclic nitrogen ligands 6,7-dihydrodipyrido-[2,3-b: 3?,2?-j]-1,10-phenanthroline (2-4N), 7,8-dihydro-6H-cyclohepta-[2,1-b: 3,4-b]-di-1,8-naphthyridine (3-4N) and 2,2?-bi-(3-methyl)-1,8-naphthyridine (Me-4N) are described. The complexes show the characteristic intraligand bands of the ligands and an electronic low energy band insensitive to solvent changes and of low intensity, which may be assigned to a ligand field band. The NMR properties agreed with the IR results showing the equivalence of the two naphthyridine fragments in the complexes. Electrochemically all the complexes display two reductions and one oxidation waves, in the potential region from +1.5 to -2.4 V vs Fc+/Fc. The water gas shift reaction (WGSR) and the selective reduction of nitrobenzene to aniline under WGSR conditions are effectively catalysed by these co