

Abstract

Advances in ligand development have allowed researchers to fine-tune the ligands and thereof their applications. To contribute to this field of coordination chemistry, we designed a new indazole containing phosphine ligand scaffold that allows facile introduction of cationic charge through methylation. With minimal changes to the structure upon methylation, we could assess the importance of the electronic effects of insertion of a positive charge on the catalytic and biological activity of the resulting silver and gold complexes.

Rationally designed phosphine ligand was used to synthesize neutral and cationic gold complexes for catalytic applications. As it is considered that cationic ligand donates less to metal to which they bind, making the metal more Lewis acidic thereof more catalytically active. Similarly, we used this phosphine ligand in combination with other auxiliary ligands to synthesize silver complexes. The antimicrobial potential of silver has been established since prehistoric times. Rationally designed silver complexes help to combat antibiotic resistant bacterial strains with greater efficiency.

All synthesized silver and gold complexes were structurally characterized by nuclear magnetic resonance spectroscopy (NMR) and Single Crystal X-Ray Diffraction analysis (SCXRD). Elemental analysis (CHN) was performed to establish bulk purity. Using the benchmark reactions of propargyl amide and enyne cycloisomerization and hydroamination reactions with and without hexafluoroisopropanol (HFIP), we observed marked differences in the catalytic activities of the neutral and cationic gold species. To assess antimicrobial potential of complexes we used standard protocol of serial dilution. Minimum inhibitory concentration (MIC) values were calculated and compared the results with standard antibiotics and silver nitrate. Anticancer potential of complexes was determined by using MTT assay. IC₅₀ values of complexes and cisplatin were calculated. In summary, our all-synthesized complexes exhibited good biological potential *in vitro* and merit more attention for further *in vivo* studies.