



## Novel Schiff-base ligands for the selective extraction and transport of transition and post-transition metal ions

Waheed Saban

Somerset West 7129, South Africa

### Abstract:

The synthesis of a new series of Schiff base ligands is reported. The ligands are fully characterized using  $^1\text{H}$  and  $^{13}\text{C}$  NMR, FT-IR, mass spectrometry and elemental analysis. The extraction and bulk liquid membrane transport abilities of the ligands were evaluated by monitoring the extraction and transport of the metal ions  $\text{Co(II)}$ ,  $\text{Ni(II)}$ ,  $\text{Cu(II)}$ ,  $\text{Zn(II)}$ ,  $\text{Cd(II)}$  and  $\text{Pb(II)}$  over a 24-hour period. Palmitic acid was included in the organic phase. All ligands showed extraction of  $\text{Cu(II)}$  and  $\text{Pb(II)}$  ions, with 2 ligands being more selective towards the extraction of  $\text{Cu(II)}$  whereas the other 2 ligands extracted more  $\text{Pb(II)}$ . The extraction of  $\text{Pb(II)}$  is most likely due to a synergistic effect, since palmitic acid was added throughout the organic phase. In the transport studies, only  $\text{Cu(II)}$  ions were transported. pH-isotherms for both  $\text{Cu(II)}$  and  $\text{Pb(II)}$  were also carried out for all ligands. Interestingly  $\text{Pb(II)}$  is extracted better at lower pH's compared to  $\text{Cu(II)}$  in two cases. This study shows how these salen-type ligands, when used together with palmitic acid, show transport selectivity for  $\text{Cu(II)}$ , and in the extraction studies, extraction selectivity for  $\text{Cu(II)}$  and  $\text{Pb(II)}$ . Crystal structures of Ligands L1 and L4 respectively and two  $\text{Cu(II)}$ -complexes with Ligands L2 and L4 were obtained. The free ligand L1 crystallizes in the  $C2/c$  space group. The final R-factor was 6.2%. The free ligand crystal structure L4 shows a structure similar to that shown with L1 with a final R-factor of 6.1%. The O atoms in this particular structure are in tris conformation to each other. In the crystal structure of the  $\text{Cu(II)}$  complex with ligand L2, the space group was  $Pbca$  and the final R-factor was 8.6%. The  $\text{Cu(II)}$  complexes with L4 is a distorted tetrahedral arrangement to the hydroxyl and the azomethine group of an adjacent ligand molecule to form a metallocycle bridged by the linkers. A new crystal structure showing how  $\text{Pb(II)}$  is coordinated to the  $\text{Cu(II)}$  complexes of L4 is reported

### Biography:

Waheed Saban, a PhD student in Chemistry presented his research work at the XXIV IUPAC ... method for the synthesis and development of core-shell modified magnetic nanostruc-



turesThe Postgraduate programme in the department offers Honours, MSc and PhD degrees in: ... to be one of the most fundamental problems facing development in South and Southern Africa next generation of interdisciplinary faculty and development of the field of biomedical ... parts: Short Courses, MSc and PhD Traineeships.

### Recent Publications:

1. Synthesis and Characterization of Schiff-base ligands for the selective extraction of transition metal ions
2. Design, synthesis and spectroscopic characterization of mixed N- and O-donor Schiff base ligands ( $\text{N}_2\text{O}_3$ ): Crystal structures of free ligands
3. Synthesis and characterization of 5- and 7-donor Schiff base ligands and spectroscopic evidence for tautomerism: A crystal structure showing tautomeric forms within one ligand
4. Synthesis, characterization and use of imidazole and methyl-pyrazole based pyridine ligands as extractants for nickel(II) and copper(II)
5. This work consists of the synthesis of seven pyridine based ligands, 2-(3-butyl-1H-pyrazol-5-yl)-pyridine (1), 2-[3-(tert-butyl)-1H-pyrazol-5-yl]-pyridine

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