# *SYNTHESIS OF NOVEL BENZIMIDAZOLE DERIVATIVES AND THEIR PLATINUM (II) COMPLEXES*

Submitted in fulfillment of the requirements
for the degree of **Master of Science**

by

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# DECLARATION

I hereby certify that this research is a result of my own investigation, which has not already been accepted in substance for any other degree and is not being in candidature for any other degree.

Signed :_____( Bongiwe P. Madlala) Date: _____

I hereby certify that this statement is correct

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# *ABSTRACT*

Benzimidazole and its derivatives have attracted many organic chemists due to their interesting biological activities. These include activities against viruses such as, HIV, RNA, herpes (HSV-1), influenza, and cytomegalovirus (HCMV); antimicrobial and antitumor activities. Even though a lot of research has been conducted on the synthesis of benzimidazoles, factors such as, drug resistance present a need for synthesis of more structural analogues of these compounds. In chapter three, the synthesis of 2-aryl-1*H*-benzimidazoles (**46a-c**) and 2-aryl-1-arylmethyl-1*H*-benzimidazoles (**49a-d**) is described. The yields for these products ranged from 44-79 % and 62-72 %, respectively.

The synthesis of novel bisbenzimidazole derivatives is described in chapter four. Direct condensation of 3,3'-diaminobenzidine (1 mmol) with 2-thiophenecarboxyaldehyde (2 mmol) afforded 2, 2'-di-2-thienyl-5,5-Bi-1*H*-benzimidazole (**52**) in 65 % yield. Except in the case of 2-furancarboxyaldehyde, the acid catalyzed condensation of 3,3'-diaminobenzidine (1 equivalent) and heteroaromatic aldehydes (4 equivalents) gave novel bisbenzimidazoles where the aldehyde added three times to 3,3'-diaminobenzidine. The four times addition product, 1,2-di-2-furanylmethyl-2,2-di-2-furanyl benzimidazole (**53**) was obtained in 53 % yield. On the other hand, the three times addition product, 1,2-di-2-pyrrolylmethyl-2,2-di-2-pyrrolyl (**54**); 1,2-di-2-thienylmethyl-2,2-di-2-thienyl (**55**); and 1,2-di-2-pyridylmethyl-2,2-di-2-pyridyl benzimidazoles (**56**) were obtained in 85, 12 and 10 %, respectively. Full characterization of bisbenzimidazoles (**54-56**) was achieved by $^{1}H$, $^{13}C$ NMR and LCMS spectra.

Although benzimidazoles have been proven to be active against various cancers, their use as ligands for platinum (II) has been reported to enhance this activity. Three new benzimidazole Pt (II) complexes were synthesized. N, N, N-bound Pt (II) complexes of 2-quinolyl-1-quinolylmethyl-1*H*-benzimidazole (**60**) and 2-pyridyl-1-pyridylmethyl-1*H*-benzimidazole (**63**) were obtained in excellent yields of 82 and 72 %, respectively. S, N-bound Pt (II) complex of 2-thienyl-1-thienylmethyl-1*H*-benzimidazole (**64**) was isolated in 63 % yield. From $^{195}Pt$ NMR spectra analysis, it was concluded that the method reported by Morgan and Burstall is more efficient for the synthesis of these complexes. In addition to $^{195}Pt$ NMR, platination was also confirmed using $^{1}H$ and $^{13}C$ NMR spectra.

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