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Synthesis of New Silver N–Heterocyclic Carbenes Complexes †

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Abstract: *N* –Heterocyclic Carbenes (NHCs) have become one of the most popular organometallic ligands. A considerable attention has been paid to the synthesis NHCs complexes owing to their significant biological activity. Many compounds containing the moiety (NHCs) have shown capacity in biomedical applications, including as antimicrobial, Antiproliferative, anticancer, anti-HIV, antiseptic, antioxidants, anti-inflammatory, and as antitumor agents.
Many years ago the researchers discovered the bioorganometallic chemistry of the silver metal. On the other hand, there were an emergent number of publications have been widely studied bioorganometallic chemistry of the Ag (I) complexes of N - heterocyclic carbenes (NHCs). Silver (I)-NHC complexes used as potential curative applications, and also are useful as carbine transfer agents. For this reason we are interested to synthesize Silver (I)-NHC.

Keywords: N –Heterocyclic Carbenes; Silver -NHC ; Synthesis

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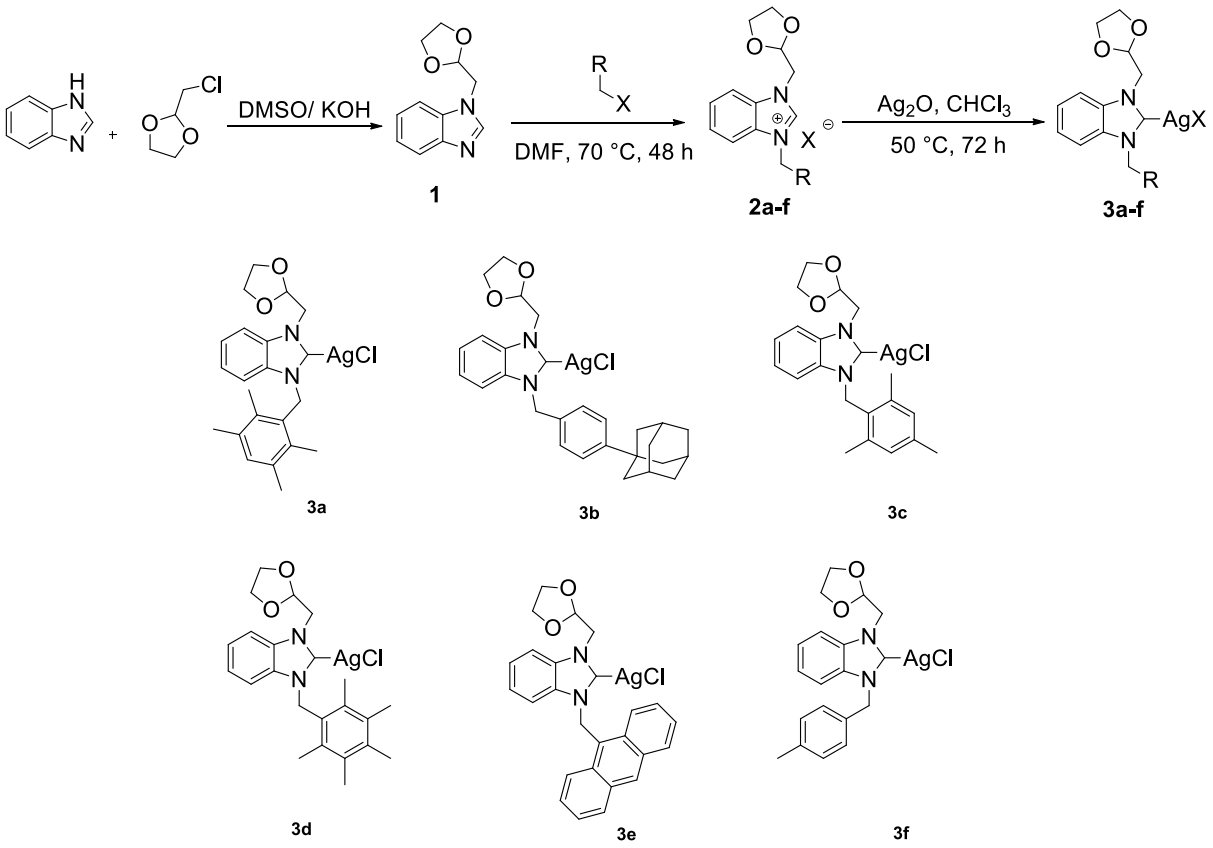
1. Introduction

N –Heterocyclic Carbenes (NHCs) have become one of the most popular organometallic ligands [1]. A considerable attention has been paid to the synthesis NHCs complexes owing to their significant biological activity [2]. Many compounds containing the moiety (NHCs) have shown capacity in biomedical applications, including as antimicrobial, Antiproliferative, anticancer, anti-HIV, antiseptic, antioxidants, antiinflammatory, and as antitumor agents,. On the other hand, there were an emergent number of publications have been widely studied bioorganometallic chemistry of the Ag (I) complexes of N -heterocyclic carbenes (NHCs). [3] Silver (I)-NHC complexes used as potential curative applications, and also are useful as carbine transfer agents [4]. For this raison we have proposed to synthesize Silver (I)-NHC complexes.

2. Synthesis

The 1,3-dioxalan-2-yl methylbenzimidazole 1 was synthesized according to our previous studies [5]. The precursors 2a–f were synthesized by the quaternization of intermediary 1 with a range of aryl bromides in DMF under 70 °C (Scheme 1). Ag-NHC complexes were synthesized according to diverse approaches; we have chosen the method described by Lin and Wang [6]. Generally, Ag_2O is the most used reagent in this process. Silver NHC complexes 3a–f were synthesized in the obscure by action of the

benzimidazolium chlorides in the presence of 1.4 equiv of Ag_2O dissolved in chloroform for 72 h, the corresponding products were achieved in good to excellent yields (56–92%).



3. Scope

Table 1. One-Pot Three-Component Click Reaction for Compounds **3a–f.**

Entry	Product	Yield %
1	3a	56
2	3b	76
3	3c	61
4	3d	80
5	3e	81
6	3f	92

4. Results and Discussion

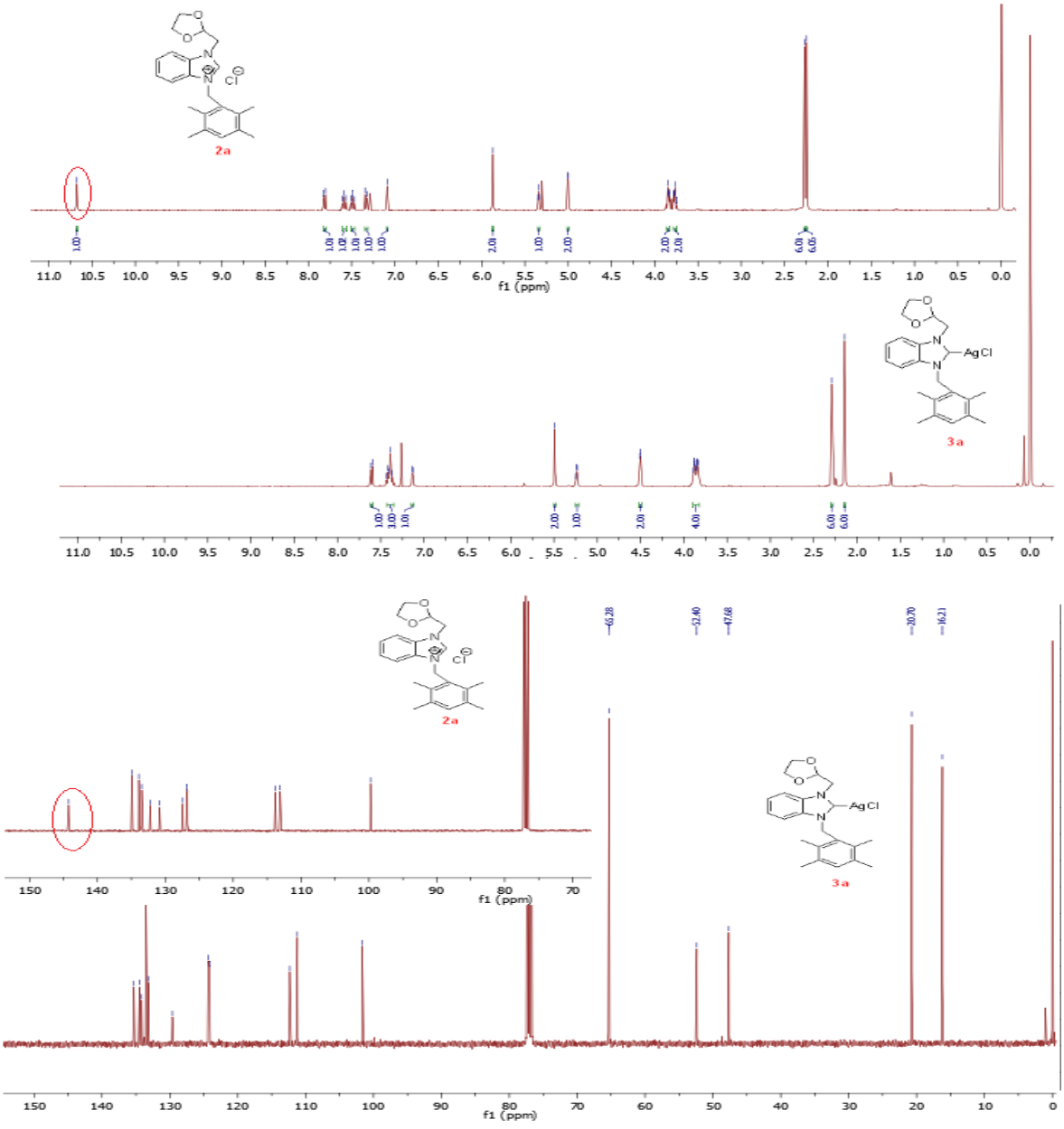
4.1. Synthesis of Ag-NHC

Silver (I)-NHC complexes 3a–f are air and moisture stables in their solid state but unstable to light. The new stable complex was soluble in halogenated solvents such as dichloromethane, chloroform and polar solvents such as dimethylsulfoxide and ethylacetate. But, these complexes were less soluble in polar solvents such as methanol and ethanol.

In 1H NMR spectra, the characteristic proton peak of the starting benzimidazolium salts is detected in the range of 10.52–11.62 ppm. This peak was not detected in the 1H NMR spectra of novel Ag-NHC complex that confirmed the formation of the Ag-NHC complexes (Figure 1). Likewise, in the 13C NMR data, the characteristic signals of carbon

(NCHN) were observed at around 144 ppm for the starting benzimidazolium salts. However, the formation of silver NHC complexes is checked by the disappearance of the signal of (NCHN). Furthermore, the CH_2 of 1,3- dioxalane protons had a resonance at 4.43–5.03 ppm, also the signal of two CH_2 protons belonging to the dioxalane cycle appear in the range of 3.58–3.90 ppm.

4.2. NMR Spectra



5. Conclusions

In summary, six new benzimidazolium salts 2a–f and their Ag (I)-NHC complexes 3a-f were synthesized with moderate to good yields. All the new compounds were confirmed by NMR, IR spectra and elemental analysis.

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