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3,4-dihydro-1,3-2h-benzoxazine: Novel reducing agent for Ag(I) ion toward nanometallic silver and its applications

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This work was divided into 4 research portions as follows. Firstly, the research presented to the synthesis of a mono-functional benzoxazine by Mannich reaction and its structural characterizations by various spectroscopic techniques such as UV-Vis, FTIR, 1H-NMR and MS. In the second part, a special property of mono-functional benzoxazine was studied for reducing silver nitrate to nano-metallic silver (Ag). By spectroscopic results, the speculated mechanism has been proposed to cationic radical reaction. The formation of nano silver from spherical silver to coral-like and dendrite-like structures was observed by TEM. For the third part, the nano-metallic silver was applied to coating materials for antimicrobial activity. Three types of materials, fumed silica (SiO2), titanium dioxide (TiO2) and carbon black (CB) were used as a powder substrate for Ag coating. The obtained Ag-coated products were characterized by XRD, XRF, EDX, TEM and TGA. Moreover, the Ag-coated powders were tested to antimicrobial activity by disk diffusion method. Again, the coated materials showed satisfied antibacterial results. Finally, the nano-Ag was used as an activation surface for copper electroless plating on non-conductive glass substrates. The results from SEM, XRD, XRF and TEM indicated that nano-metallic Ag was successfully prepared and could be coated on the glass substrate. According to the SEM and AFM observation, the deposited Cu film was uniformly growth as a smooth film of dense particles. In addition, the adhesion of the deposited copper was conducted by using the tape-test technique according to ASTM D3359-02, and the results exhibited a strong adhesion of the copper film on the glass substrate.

Biography

Attaphon Kaewvilai has expertise in 3,4-dihydro-1,3-2H-benzoxazines and its metals ions responsive property. He can be modifying structure of benzoxazine for improving the metal ions responsive property. Moreover, he firstly report the novel ligand based mono-functional benzoxazine for Ce(III) ions. He has applied the ions responsive property of benzoxazine as a starting material for preparation of advanced materials such as nano ceria, and metal ions sensing materials. Now, he proposed an interesting phenomena for the reduction of Ag(I) Ion to nano metallic silver and their coating applications such as antibacterial materials and electroless copper plating.

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