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## Synthesis and Characterization of Nitrogen Doped Titania Nanomaterials of Homogeneous Particle Size

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### ABSTRACT

Modification of sol gel method was used to synthesize homogeneous particle size nitrogen doped titania (N-TiO<sub>2</sub>) nanomaterials using tetraethyl ammonium hydroxide as N source. XRD analysis showed that these N-TiO<sub>2</sub> (1-5 % N concentration) crystallized in anatase structure. The crystallinity of the samples decreased with increasing of N content. The calculation using Scherrer equation showed that the particle size of the synthesized N-TiO<sub>2</sub> ranged 15.02-26.85 nm, strongly suggesting attainment of nanomaterials. DR UV-Vis results indicated that the band gap energy of 5% N doped TiO<sub>2</sub> was only 2.58 eV, implying the sample could be a potential photocatalyst under visible light irradiation. Homogeneous particle size of the synthesized nanomaterials was evidenced through FESEM images. Meanwhile, the EDX analysis confirmed the homogenous distribution of elements Ti, N and O in 5% N doped titania sample.

| Titania | Nitrogen | Doped | Nanomaterials | Homogeneous |

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## Bimetallic Copper–Gold Pyrazolate Complexes for Photocatalytic Removal and Degradation of 2,4–Dichlorophenoxyacetic Acid

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### ABSTRACT

Utilization of metal oxides and complexes in catalysis reactions has been drastically studied using transition metal ions with various ligands for improvement of catalytic activity. On the other hand, transition metal ion and oxides have been reported to give enhancement of photocatalytic activity of photocatalyst TiO<sub>2</sub> for removal of environmental pollutants. However, there is no study on photocatalytic reaction using modification of TiO<sub>2</sub> with bimetallic complexes. Here in, we report on first study on photocatalytic activity of bimetallic copper–gold pyrazolate complex for removal and degradation of 2,4–dichlorophenoxyacetic acid (2,4–D). The bimetallic copper–gold pyrazolate complexes were prepared by mixing gold(I) pyrazolate complex with copper(II) pyrazolate complex in dry dichloromethane for 1 hour in stoichiometric molar ratios of copper to gold; 1:0.2, 1:0.4, 1:0.6, 1:0.8, and 1:1. In order to synthesize the photocatalyst, bimetallic copper–gold pyrazolate complex was mixed with TiO<sub>2</sub> in dichloromethane and followed by calcination at 100°C for 4 hours. Gold (I) pyrazolate complex gave 81% for percentage of 2,4–D removal using 0.4 wt% that was higher than TiO<sub>2</sub> (80%) with the same percentage of degradation in 19%. In contrast, copper (II) pyrazolate complex with 0.4 wt% gave 98% of removal with 27% degradation of 2,4–D. Surprisingly, the resulting copper–gold with ratio of 1 to 1 gave almost the same percentage of removal but increase the degradation to 51% compared to copper(II) pyrazolate complex. The result showed that the photocatalytic activity of TiO<sub>2</sub> can be increased by using mixture of two different metal complexes as co-catalyst.

| Bimetallic copper–gold | 2,4–Dichlorophenoxyacetic acid | Photocatalyst | Titanium oxide |

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