

**SYNTHESIS, CHARACTERIZATION AND CATALYTIC ACTIVITY
OF PALLADIUM(II)-1,3-BIS[(4-CHLOROPHENYL)METHYL]-1-
BENZIMIDAZOLIUM BROMIDE COMPLEX
IN HECK REACTION**

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**Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Chemistry
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JULY 2017

This Final Year Report entitled “**Synthesis, characterization and catalytic activity of Palladium(II)-1,3-Bis[(4-chlorophenyl)methyl]-1-Benzimidazolium Bromide complex in Heck reaction**” was submitted by Nina Natasha Binti Md Sani, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

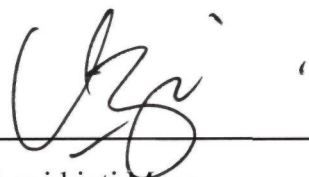


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ABSTRACT

SYNTHESIS, CHARACTERIZATION AND CATALYTIC ACTIVITY OF PALLADIUM(II)-1,3-BIS[(4-CHLOROPHENYL)METHYL]-1-BENZIMIDAZOLIUM BROMIDE COMPLEX IN HECK REACTION

Homogeneous catalysis has through a new development in the organometallic complexes application as a catalyst. This organometallic catalyst can increase the economic viability of the country by doing some innovation on homogeneous process in chemical reaction. This research report on the synthesis, characterization and catalytic activity of 1,3-Bis[(4-chlorophenyl)methyl]-1-Benzimidazolium Bromide (NHC ligand) and Pd(II)-1,3bis-[(chlorophenyl)methyl]-1-benzimidazolium Bromide complex (Pd(II)-NHC). The synthesise NHC ligand containing NHC's functionality was prepared by the reaction of benzimidazole and 4-chlorobenzylbromide. The targeted complexation were produce by reacting together NHC ligand with PdCl₂. All products were characterized by Fourier Transform Infrared (FTIR), CHN elemental analysis, Nuclear Magnetic Resonance (NMR), Ultraviolet-Visible spectrophotometer (UV-Vis). In CHN, the experimental result for both NHC ligand and Pd(II)-NHC complex almost similar with its calculation result and this result was accepted. The changes stretching frequency in FTIR from lower to higher shows that the complexation with Pd metal are occurs. The number of expected hydrogen and carbon can be observed by using NMR. The important peak of H-1 in ¹H NMR was disappeared after complexation. The changes of chemical shift at C-1 shows that the carbon carbene was successfully attached with metal. The UV graph shows disappearance and shifted to 282 nm of PdCl₂ maximum absorption peak after complexation to form Pd(II)-NHC complex. The result that come out from the CHN, FTIR, NMR and UV-Vis spectroscopy was confirmed that targeted compound which is Pd(II)-NHC complex are successfully synthesized. The catalytic performance of the Pd(II)-1,3-bis[(4-chlorophenyl)methyl]-1-benzimidazolium Bromide complex were studied in Heck C-C coupling reaction by using 1-bromo-4-nitrobenzene and styrene as a starting material. The product has been characterized by FTIR and the catalytic activity was determined by using GC-FID. Effect of catalyst loading and effect of time were used as a parameter to observed changes in conversion rate and selectivity. The experimental result was showed at 0.5 mmol % of catalyst loading with 124 turnover number (TON) and at 130 °C in 60 minutes was achieved an excellent catalytic activity.