UNIVERSITI TEKNOLOGI MARA

TITANIUM DIOXIDE AND COBALT OXIDE AS A CATALYST IN CATALYTIC CONVERTER FOR 4-STROKE MOTORCYCLE ENGINE

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ABSTRACT

Motorcycle production has been expanding rapidly over the past several years, especially in the urbanized areas of Malaysia. The sales of a new motorcycle are expected to continue to increase. Motorcycles emit large amount of hydrocarbons (HC), carbon monoxide (CO) and particulate matter. These pollutants have significant adverse health effects and deteriorate environmental quality. The emissions contribute to poorer air quality due to the increasing number of motorcycle. This is especially noticeable in densely populated areas of Malaysia, which relies on motorcycles as an essential means of transportation. To address the serious pollution problems posed by motorcycles, a growing number of countries have implemented or are in the process of implementing motorcycles pollution control programs aimed to reduce harmful emissions from motorcycles engine. Catalytic converter have been developed as a result of these regulations and it is generally recognized to be the most cost-effective way to meet stringent emission standards. Catalytic converter technology uses a metal catalyst to chemically convert the harmful components of the motorcycles exhaust stream in to harmless gases. A “tree ways catalytic material” causes the desired chemical reactions to occur without being consumed. Catalytic converter for 4-stroke motorcycle engine was designed similarly to three-way conversion catalyst (TWC) where that catalytic control system can promotes the reaction of hydrocarbons (HC) and carbon monoxide (CO) with oxygen to form carbon dioxide and water, beside the both reaction above these technology also bring the simultaneous chemical reduction of oxides of nitrogen (NO_x) to nitrogen gas. In this study cobalt based titanium dioxide was used as a metal catalyst to replace the precious metal conventionally used in our market. As a substrate woven stainless steel was introduced to replace the role of honeycomb structure. Several testing were conducted, and outstanding comparative performance was obtained using the newly developed catalytic converter

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Motorcycle emits substantial quantities of hydrocarbons (HC), carbon monoxide (CO) and particulate matter. These pollutants have significant adverse health effects and deteriorate environmental quality. The contribution to urban air pollution where these vehicles are in use has become an increasingly common phenomenon. This is especially significant in highly populated areas that rely on motorcycle as an important means of transportation.

Worldwide, motorcycle usage is increasing rapidly, especially in the urbanized areas of Asia. Well over 100 million motorcycles are currently in use and this number is expected to grow at a rate of 7 million vehicles per year. At end of 2002 there were 12.02 million registered vehicles in Malaysia, whereby 51.40% or 5.84 million are motorcycle as show in Tables 1.1 and 1.2 respectively. The 2-stroke and 4-stroke engines account for the majority of these vehicles (Hwang et al., 1997).

Motorcycle engines have very high exhaust emission. The large motorcycle population accounts for a significant portion of the global mobile source of hydrocarbon (HC) and carbon monoxide (CO). NO_x emissions from motorcycle engine are relatively small compared to other mobile sources. Confronted with the need to address deteriorating air quality, a growing number of countries worldwide have implemented, or are in the