

DETERMINATION OF MECHANICAL AND CHEMICAL
PROPERTIES OF BRAKE PADS FOR
LIGHT RAIL TRANSIT APPLICATIONS



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ABSTRACT

Light Rail Transit (LRT) is an emerging mode of public transportation in Malaysia. Currently there are three commercial LRT Operators namely, STAR-LRT, PUTRA-LRT and KL Monorail, which provide commuting service in and around Kuala Lumpur. The braking systems of all these LRT trains incorporate commercial brake pads that are imported. This work deals with developing a formulation as a substitution for the brake pads imported for LRT-Putra. 30 formulations are made and compared with the commercial brake pad using many characterization techniques viz., ESEM, EDAX, XRD, XRF, TGA, TMA, TG-MS, hardness tests, sp. gravity tests, transverse rupture strength tests and thermal conductivity tests.

Chapter I introduces the brake pads used in LRT Putra, the purpose of brake pads, types of brake pads, the requirements of brake pads, about friction materials, compositions of brake pads, constituents of friction materials, manufacturing of brake pads, raw materials used for manufacturing semi-metallic brake pads, and SWOT analysis of Malaysian brake industries.

Chapter II presents the overview on friction materials together with raw materials used for making formulations. In this chapter, the details about the usage of brake pad in LRT and characterization of commercial brake pad have been provided. Characterization techniques are listed. Further, the size and shape of specimens and classification of formulations which based on friction and wear, road testing and physical properties have been discussed.

Chapter III discusses the procedures involved in characterizing brake friction materials. Descriptions of the apparatus used and the procedures for conducting the tests, precautions and safety measures taken during testing are documented.

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CHAPTER I

1.0 Introduction

Light Rail Transit (LRT) is an emerging mode of public transportation in Malaysia. Currently there are three commercial LRT Operators namely, STAR-LRT, PUTRA-LRT and KL Monorail, which provide commuting service in and around Kuala Lumpur. The braking systems of all these LRT trains incorporate commercial brake pads that are imported. The life span of commercial brake pads varies from one system to another depending on the constituent materials besides braking procedure and maintenance requirements.

There are different types of friction materials on the market, which can be classified into the following three categories: Semi Metallic (SM), Non Asbestos Organic (NAO) and Sinter Metal. They are mainly composed of a relatively large amount of iron powder and steel fibers, some graphite, rubber, organic fibers, ceramic materials, abrasives, lubricant and filler. The mixture is bonded together by a thermosetting phenolic resin. A wide variety of elements are employed in the making of the brake pads to obtain the necessary performance criteria for efficient braking criteria.