UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF EPOXIDIZED PALM OIL BASED COATING MATERIAL FROM USED COOKING OIL AND ITS ADHESION PERFORMANCE

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ABSTRACT

Used cooking oil thrown away as waste could possibly causing pollution. By utilizing the used cooking oil which is additional component in formulating new epoxy coating, this could contribute in increasing sustainability of palm oil industry. In the same time, dependency on epoxy resin which has been used as main raw material in epoxy coating can be minimized because of it harmful effects towards human health. Used cooking oil experienced epoxidation process to add oxirane ring into the structure of fatty acid. Oxirane ring provide reactive site for crosslinking process in coating formulation. Formulated coating was then tested for their adhesion performance to determine the best coating's formulation which gives the best adhesion on the substrate. Result from X-Cut tape test showed that minimal adhesion performances were obtained from every coating formulation. This is in conjunction with spectrum analysis of used cooking oil before and after epoxidation where it showed that there is non-existence of oxirane ring in the epoxidized cooking oil. Adhesion performance results from Cross-Cut tape test have no distinctive trend that can be supported by fourier transform infrared spectroscopy (FTIR) analysis.

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INTRODUCTION

1.1 Research Background

Oil palm tree (*Elaeis guineensis jacq.*) originates from West Africa where it was introduced to Malaysia by the British as ornamental plant in early 1870. Later on, the oil palm tree were commercialized to obtain palm oil which is use as cooking oil because it more versatile and offers functional benefits such as better performance at high temperatures than some other oils and fats. Palm oil also has a long shelf life due to high resistance to oxidation and will not affecting the taste or smell of food [1].

Palm oil is obtained from palm fruit. Palm fruit is drupe oval in shape and contains kernel which is the seed. The kernel is enclosed by hard shell (endocarp), fibrous fruit pulp or tissue containing oil (mesocarp). Palm oil is extracted from fibrous pulp (mesocarp) while palm kernel oil is extracted from the seed (kernel). The palm fruit can undergoes oil extraction only after the fruit has ripe. The palm tree bears fruits within two to three years, and continues to do so for the next 20 to 25 years, producing a Fresh Fruit Bunch (FFB) every 10 to 21 days [2].

Palm oil is mostly used as cooking oil in Malaysia and others south-eastern asia countries due to its high availability and as south-east asia is the world's largest palm oil producing region. Before palm oil can be used as the cooking oil, it will undergo refining process where the palm oil will experience either physical refining or chemical refining. The purpose of refining the palm oil is to remove minor unwanted constituents in the oil and in the same time least affecting the acylglycerols consist in the oil and minimise the loss of desirable constituents [3].

Palm oil is excellent to be used as cooking oil due to its resilient properties when exposed to extreme heat. Palm oil is more resistant and suitable to be used compared to other vegetable oil. Furthermore, low amount of unsaturated fatty acid make it less tendency of polymerization to occur and high antioxidant content make it resistant to oxidation [4].