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Title : PHYSICAL, CHEMICAL AND MECHANICAL CHARACTERIZATION OF HEAT TREATED MALAYSIAN HARDWOOD TIMBERS

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As timber with natural durability and excellence properties is limited and high in price, there is a need to make use of the timber with low durability and properties. In order to use this kind of timber, the timber need to be treated to improvised its properties and durability. The well-known treatment used worldwide is by using chemical preservative; however this kind of treatment is bad to the environment. Therefore there is a need to find an alternative way to replace this treatment with an environmental friendly way of treatment. Heat treatment is one of the treatments which may equip the timber with new properties without using any chemical or preservative but heat where the heat is used to achieve new material properties rather than to dry the wood. Heat treatment generally causes an apparent decrease in wood mechanical properties due to the material losses in cell wall, hemicelluloses degradation and the modification of long chain molecules. Therefore this study investigated the effect of heat treatment on the physical, chemical and mechanical properties of four different species of Malaysian hardwood timbers; Pauh Kijang (SG3), Kapur (SG4), Keruing (SG5) and Light Red Meranti (SG6) after had been treated by heat. The size of the timber beam for each species is 50mm x 90mm x 1800mm. The total numbers of sample for each species are 90 which 15 numbers of sample allocated for control, kiln dried and four levels of heat treatment. There are four different levels of temperatures namely 150°C, 170°C, 190°C and 210°C were applied

on the timber beam samples within 1 hour. Control and kiln dried samples been used as comparisons to each test conducted to identified the changes occur on the timber properties after heated. This study found that all of the properties for each species of timbers used were affected by heat. The moisture content and density were decreased as temperature increased except for Pauh Kijang at 190°C. The reduction in the density is due to the loss of mass which partly effected by the degradation of hemicellulose and α -cellulose. The colour turned darker as the temperatures increased for these four species of heat treated timber which had been analyzed by CIE-Lab system. The Modulus of Elasticity (MOE) and the bending strength, Modulus of Rupture (MOR) of these four species of Malaysian hardwood timber showed a positive increment after been treated at temperature level of 150°C, 170°C and 190°C but decreased at 210°C. The improvement in MOE and MOR are seen due to the densification of wood as the lignin content increased at higher temperatures. At 190°C, the MOR and MOE values of all species are still higher than the MOE and MOR of the control and kiln dried samples. This shows that 190°C is the suitable temperature. It was also found that the heat treatment has improved the strength of lower density timber significantly.