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INVESTIGATION OF THE SUITABILITY OF POLYPHOSPHORIC ACID IN REDUCING THE DEGREE OF THERMAL AGING OF AGBABU NATURAL BITUMEN

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ABSTRACT

Bitumen otherwise known as asphalt is a complex mixture of hydrocarbons which are naturally occurring or obtained from crude oil distillation. Bitumen when used as a binder in road pavement deteriorates with time as result of traffic load and contact of the pavement with environmental factors. The degradation of bitumen causes a rapid aging of the asphalt based pavement leading to road problems such as rutting, potholes etc. This deterioration is attributed to oxidative degradation of molecules of bitumen by factors such as heat, moisture and sunlight. This study investigates the viability of using polyphosphoric acid (PPA) to reduce the oxidative degradation effect of heat (at 60°C) on constituents of Agbabu Natural Bitumen (ANB) with a view to making it more durable when used for road pavement. Modification of ANB with PPA was carried out at 160°C using melt blend technique. Thereafter, the PPA modified and neat ANB samples were thermally aged in a hot air oven at 60°C. Fourier Transform Infrared (FTIR) Spectroscopy was used to validate the changes in the structure of ANB and aging indexes of neat and PPA modified samples of ANB calculated. The result showed that aging indexes of PPA modified samples of ANB were lower compared with that of the neat or unmodified samples of ANB. This implies that the rate of aging (at 60°C) of the unmodified ANB was faster than that of PPA modified ANB. Thus, a good potential for reducing thermal aging in ANB was found in PPA.

Keywords: Agbabu Natural Bitumen, Polyphosphoric acid, FTIR analysis, Aging, Oxidative degradation