

***CONCLUSION***

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### Conclusion

I-Preliminary experiments illustrate the suitable epoxidation condition for natural rubber, styrene butadiene rubber using preformed peracetic acid (aqueous solution 59%)

1-The parameters suitable for blending asphalt cement with epoxy resins are determined under suitable curing temperature and time of 150–170°C, and 20h respectively. The quantity of curing agent (MA) is 40% of the weight of epoxy resin.

2-The suitability of mixtures subjected to Marshall Test were determined, at percentages of asphalt, and asphalt modified =5.5% of asphalt paving mixtures

3-It is possible to use the prepared modified asphalt cement 60/70 penetration grade with the prepared epoxy resins based on (ENR, ESBR) for pavement. This modification improves the mechanical properties of asphalt paving mixture from Marshall Stability values (11500, 1200)N in case of sample (L), (L1) respectively, to (16635, 17222)N in case of sample (L4), (L5) respectively

II-Asphalt polyurethane foams were synthesized from prepared polyurethane, which was modified with polyacrylic acid water base commercial [Addibond 65], and polyurethane based on epoxidized linseed oil at different NCO/OH ratios

1-Since sound proofing performance is one of the most important factor in the evaluation of sound proofing material in many applications such as (automobiles, building construction, etc.).

2-The sound reduction increase from (8, 44) dB in case of asphalt foam at NCO/OH ratio (1.1, 1.2) respectively to (50, 59) dB in case of modifying asphalt foam with 20% polyurethane based on ENR, and 3% acrylic acid water base respectively.

3-The vibration damping performance which represented by loss factor increase from (14.5, 18) dB in case of asphalt foam at NCO/OH ratio (1.1, 1.2) respectively, to (22, 29) dB in case of modified asphalt foam with 20% polyurethane based on ENR,

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and 3% acrylic acid water base respectively. Increasing loss factor, consequently decrease vibration in the specimen

4-TGA increased from (354 to 364°C) in case of asphalt foam at NCO/OH ratio 1.2, modified with 20% polyurethane of ENR.

III-Introduction of oxidized asphalt in rubber industries using 50%w/w natural rubber with sulfur and macromolecules system to reduced the time of prepared sample from 30min to 10min and improvement the mechanical properties by adding nano carbon black and nano clay.

1-The value of tensile strength, and elongation at break increased from 43.9kgf/mm<sup>2</sup>, 905% to 46.59kgf, and 958% in case of VNR, and VNRBA<sub>50-3</sub> respectively.

2-The values of DSC show sign of physical change in the morphology of the samples at temperature of 352°C, 382 °C in case of VNR, VNRBA<sub>50-3</sub> respectively. The value of TGA increased from 367°C to 377°C in case of VNR, VNRBA<sub>50-3</sub> respectively.

3-The addition of 15% nano carbon black to VNRBA<sub>50-3</sub> increased the tensile strength value to 51.9Kgf/mm<sup>2</sup>, and elongation at break to 1003.9%.

4-The addition of 15% nano clay to VNRBA<sub>50-3</sub> decreased the tensile strength value to 39.77 Kgf/mm<sup>2</sup>, and elongation value at break to 724%. Using 15% nano clay+10% nano carbon black without using ZnO, improving the value of tensile strength and elongation at break to 40.8kgf/mm<sup>2</sup>, 780% respectively.

5-The addition of nanocomposites (carbon black, clay) improved the thermal stability which indicated from  $\Delta T_g$  value which has value of 0.13 °C in case of VNRBA<sub>50-3C5</sub> and 0.5 °C in case of VNRBA<sub>50-3</sub><sup>3</sup>. However,  $\Delta T_g$  value of VNR =1.42°C, and VNRBA<sub>50-3</sub>= 1.37°C.

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