

## Evaluation of the Rheological Properties of Bituminous Binders Modified with Biochars Obtained from Various Biomasses by Pyrolysis Method

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**Abstract :** In this study, apricot seed shell, walnut shell, and sawdust were chosen as biomass sources. The materials were sorted by using a sieve No. 50 and the sieved materials were subjected to pyrolysis process at 400 °C, resulting in three different biochar products. The resulting biochar products were added to the bitumen at three different rates (5%, 10% and 15%), producing modified bitumen. Penetration, softening point, rotation viscometer and dynamic shear rheometer (DSR) tests were conducted on modified binders. Thus the modified bitumen, which was obtained by using additives at 3 different rates obtained from biochar produced at 400 °C temperatures of 3 different biomass sources were compared and the effects of pyrolysis temperature and additive rates were evaluated. As a result of the conducted tests, it was determined that the rheology of the pure bitumen improved significantly as a result of the modification of the bitumen with the biochar. Additionally, with biochar additive, it was determined that the rutting parameter values obtained from softening point, viscometer and DSR tests were increased while the values in terms of penetration and phase angle decreased. It was also observed that the most effective biomass is sawdust while the least effective was ground apricot seed shell.

**Keywords :** rheology, biomass, pyrolysis, biochar

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