

Microstructure analysis of porous asphalt incorporating kenaf fiber in the pavement

Khairil Azman Masri^a, Nur Hamizah Katini^a, Ahmad Kamil Arshad^b, Shoaib Shahnewaz^a, Rashida Ferdaus^a

^aDepartment of Civil Engineering, College of Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Gambang, Kuantan, Pahang, Malaysia

^bInstitute for Infrastructure Engineering and Sustainable Management (IIESM), Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

khairilazman@ump.edu.my

ABSTRACT

Hot mix asphalt (HMA) is the most of the popular pavement in Malaysia and most economical materials available. Besides that, this pavement type also very suitable with this country climate but HMA need frequency rehabilitation and maintenance due the damages caused by traffic load. In ways to minimize the damage and increase the services life of pavement, modification of asphalt binder is one of the approaches to improve pavement performance and services life. HMA can be modified with many types of fibre including natural fibre. This study utilises the usage of natural fibre as modifier of porous asphalt. The performance of modified porous asphalt is assessed by microstructure analysis. Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDX), Fourier Transform Infrared Spectrophotometer (FTIR), Powder X-ray Diffractometer (XRD), and Permanence Deformation Resistance are some of the laboratory results that have been used. The characteristics of PA modification with 0.3% kenaf fibre are demonstrated in this research. In the interior structure of PA, kenaf fiber diffuses effectively. C and Ca elements contributed the most in the experiment, as did the element and chemical content of PA modified with kenaf fiber. In comparison to the control specimen, changed PA has more persistent deformation and PA with 0.6% kenaf fiber had the greatest resilient modulus value. From the results, it displays that the addition of natural fibre is able to enhance the performance of porous asphalt. This study also promotes the sustainable building materials especially in pavement construction.

KEYWORDS: Natural fiber, Porous asphalt, Microstructure analysis, Scanning electron microscope

DOI: <https://doi.org/10.1016/j.matpr.2021.10.194>

ACKNOWLEDGEMENTS

The authors would like to acknowledge Malaysian Higher Education for funding this research under FRGS-Racer Grant number RACER/1/2019/TK06/UMP/1 and University Internal Grant RDU190387.

REFERENCES

- [1] [G.N. Chavanpatil, S.S. Chokakkar, The study of porous asphalt pavement with emphasis in road construction design, Int. Res. J. Eng. Technol. 5 \(6\) \(2018\).](#)
- [2] M.Y. Aman, M.O. Hamzah, Effects of anti-stripping additives on moisture sensitivity of warm porous asphalt mixtures, *Int. J. Constr. Technol. Manage.*, 2014, (1), ISSN 2289 4454.
- [3] M.R. Hainan, M.K. Idham, N.S.A. Yaro, S.O.A.E. Hussein, M.N.M. Warid, A. Mohamed, S.N. Naqibah, P.J. Ramadhansyah. Performance of hot mix asphalt mixture incorporating kenaf fiber. *IOP Conf. Series: Earth Environ. Sci.* 140, 2018, 012092.
- [4] M.D. Sani, C.P. Ng, N. Ahmad, A.Z. Abd Latib, M.A. Yusof, M.A. Mat Rani, Properties of coir fiber and kenaf fiber modified asphalt mixes. *J. East. Asia Soc. Transp. Stud.*, 9, 2011.
- [5] ...