Pengaruh Penambahan Limbah Plastik Multi Lapis Berbasis Polipropilena Teroksidasi Sebagai Pemodifikasi Dengan Suhu Pencampuran 180°C Terhadap Karakteristik Perkerasan Aspal = Effect On Addition Of Oxidized Polypropylene Multilayer Plastic Waste For Bitumen Modifier With A Mixing Temperature Of 180Â°C On The Characteristics Of Asphalt Concrete Wearing Course

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Abstrak

Jumlah konsumsi mie instan di seluruh dunia menjadikan sampah kemasan mie instan berbahan multi lapis PP menjadi salah satu penyumbang limbah terbanyak dengan pengelolaan yang kurang baik dikarenakan strukturnya yang berlapis membuatnya sulit didaur ulang. Salah satu peluang yang sangat memungkinkan untuk pemanfaatan sampah kemasan plastik mie instan adalah menjadikannya bahan campuran perkerasan aspal dalam bentuk polymer modified bitumen (PMB). Pada penelitian ini, dilakukan penambahan limbah plastik mie instan yang telah dilakukan perlakuan plasma dingin dan oksidasi termal dalam bentuk PMB menggunakan metode hot mix pada suhu 180°C sebagai campuran pembuatan asphalt concrete-wearing course (AC-WC). Dilakukan variasi jumlah kadar kemasan plastik multi lapis PP 0, 1, 3, dan 5 wt.% dari berat total bitumen. Dilakukan pengujian FTIR, DSC, dan sessile drop test untuk mengetahui hidrofilisitas dan kompatibilitas plastik multi lapis PP. Dilakukan juga pengujian daktilitas, penetrasi, dan pengamatan optical microscope untuk melihat morfologi dan sifat fisik sampel PMB serta dilakukan Marshall test untuk mengetahui sifat fisik sampel. Hasil pengujian menunjukkan bahwa perlakuan plasma dingin dan oksidasi termal terbukti meningkatkan hidrofilisitas serta kompatibilitas plastik multi lapis PP. Peningkatan kadar plastik terbukti meningkatkan distribusi partikel plastik, menurunkan nilai penetrasi dan daktilitas pada PMB, serta meningkatkan ketahanan deformasi plastis, deformasi elastis, dan menurunkan jumlah rongga udara pada sampel perkerasan aspal.

.....The worldwide consumption of instant noodles has resulted in packaging waste made of multilayer polypropylene (PP) becoming one of the largest contributors to waste, with inadequate management due to its layered structure, making it difficult to recycle. One potential opportunity for utilizing instant noodle plastic packaging waste is to use it as a mixture material for asphalt concrete in the form of polymer modified bitumen (PMB), which would also improve the quality of Indonesian roads. In this research, plastic waste from instant noodle packaging that has undergone cold plasma treatment and thermal oxidation was added in the form of PMB using the hot mix method at a temperature of 180°C as a mixture to produce asphalt concrete-wearing course (AC-WC). The amount of multilayer PP was varied at 0, 1, 3, and 5 wt.% of the total bitumen weight. FTIR, DSC, and sessile drop tests were conducted to determine the hydrophilicity and compatibility of the multilayer PP. Additionally, ductility, penetration, and optical microscope observations were conducted to examine the morphology and physical properties of the PMB samples, and Marshall tests were conducted to determine the physical properties of the samples. The test results showed that cold plasma treatment and thermal oxidation increased the hydrophilicity and compatibility of the multilayer PP. An increase in the amount of multilayer PP in the mixture increased the distribution of plastic particles, decreased the penetration and ductility values of PMB, increased plastic

deformation resistance, elastic deformation, and reduced the amount of air voids in the asphalt concrete samples.