Modifikasi bitumen dengan penambahan high density polyethylene (HDPE) dan polypropylene serta lignin melalui metode hot melt mixing = Modified bitumen with addition of high density polyethylene (HDPE) and polypropylene and lignin through hot melt mixing method

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Abstrak

Penelitian ini bertujuan mencari solusi permasalahan seperti kerusakan aspal, pencemaran lingkungan oleh limbah plastik dan lignin. Melalui studi literatur, ditemukan plastik dapat menguatkan sifat aspal yang lemah terhadap air. Namun, aspal dan plastik tidak kompatibel karena sifat aspal yang hidrofilik dan sifat plastik yang hidropobik. Oleh karena itu, lignin yang mempunyai kedua sifat tersebut digunakan sebagai coupling agent. Bitumen pen 60/70 dimodifikasi dengan menambahkan plastik Polipropilena PP dan High Density Polyethylene HDPE lalu dicampur melalui metode Hot Melt Mixing. Variabel tetapnya ialah waktu, temperatur proses, dan putaran alat pengaduk yaitu 30 menit, 180oC, dan 60 rpm. Variabel bebasnya ialah komposisi campuran PP yaitu 3wt, 4wt, 5wt, HDPE yaitu 5wt, 6wt, 7wt dan lignin. Putaran pertama proses sampel tidak ditambahkan lignin, putaran kedua sampel ditambahkan lignin 0,3wt. Setelah itu, hasil proses campuran yang disebut Polymer Modified Bitumen PMB, dikarakterisasi. Karaterisasi sifat kimia campuran menggunakan Fourier Transform Infrared FTIR, Thermo Gravimetric Analyzer TGA, dan Differential Scanning Calorimetry DSC dan karakterisasi mekanik sifat penetrasi, daktilitas, dan titik lembek. Hasil pengujian menunjukkan Polyblend PP/HDPE menambah sifat mekanik bitumen, lignin meningkatkan kompatibilitas antara bitumen dan plastik, serta diperlukan coupling agent tambahan untuk menyatukan antar plastik PP dan HDPE yang viskositasnya berbeda.

.....This study aims to find solutions to problems such as damage to the asphalt, pollution of environment by plastic waste and lignin. Through literature, discovered the plastic can strengthen the weak nature of the asphalt to water. However, asphalt and plastics are not compatible because of the nature of the asphalt hydrophilic and hydrophobic properties of the plastic. Therefore, lignin which has both these properties is used as a coupling agent. 60 70 bitumen modified by adding plastic Polypropylene PP and High Density Polyethylene HDPE and then mixed with Hot Melt Mixing method. Fixed variable is time, process temperature, and mixer rotation which are 30 minutes, 180 C, and 60 rpm. The independent variables are the composition of the mixture of PP i.e. 3wt, 4wt, 5wt, HDPE i.e. 5wt, 6wt, 7wt and lignin. The first round of the sample is not added lignin, the second round of sample was added lignin 0,3wt. After that, the process results, a mixture called Polymer Modified Bitumen PMB, characterized. Chemical properties characterization of the mixture using a Fourier Transform Infrared FTIR, Thermo Gravimetric Analyzer TGA, and Differential Scanning Calorimetry DSC and the characterization of the mechanical properties of penetration, ductility, and the softening point. The test results showed polyblend PP HDPE adds to the mechanical properties of bitumen, lignin improve the compatibility between bitumen and plastic, as well as additional coupling agent is required to bring together between PP and HDPE plastic which different viscosity.