Modifikasi bitumen dengan lignin dan kantong kresek high density polyetylene (HDPE) = Modification of bitumen with lignin and high density polyetylene (HDPE) plastic

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Abstrak

[ABSTRAK
Pada aplikasinya, konstruksi jalan masih memiliki banyak kelemahan antara lain mudah rusak pada saat terdapat genangan air sehingga akan memperpendek umur pakai jalan. Pada penelitian ini akan dilakukan modifikasi dari bitumen yang merupakan bahan utama pembuatan jalan dengan cara penambahan High Density Polyehtylene (HDPE) dan liginin pada campuran bitumen pen 60/70. Hal ini dapat menurunkan nilai penetrasi sehingga menjadikan bitumen lebih keras dan tahan ketika diberikan beban kendaraan yang berulang, meningkatkan titik lembek, dan menurunkan daktilitas. Selain itu, penambahan lignin sebagai coupling agent dapat meningkatkan kompaktibilitas antara HDPE dengan bitumen karena lignin yang memiliki gugus polar dan non-polar. Kadar lignin yang digunakan yaitu 0,1%, 0,3%, dan 0,5%. Selain itu, penelitian ini juga ingin mengetahui pengaruh temperatur proses yaitu 140˚C, 160˚C dan 180˚C dan waktu pencampuran yaitu 15, 30, dan 45 menit terhadap sifat bitumen hasil modifikasi. Untuk itu dilakukan pengujian mekanik dan karakterisasi campuran untuk melihat kekuatan dari bitumen dan kompatibilitas antara bitumen, HDPE, dan lignin. Pengujian dilakukan melalui uji daktilitas, penetrasi, dan titik lembek. Sedangkan, karakterisasi dilakukan dengan menggunakan Fourier Transform Infrared (FTIR), Thermo Gravimetric Analyzer (TGA), dan Differential Scaning Calorimetry (DSC). Dari hasil pengujian menunjukkan semakin tinggi kadar dari liginin dan semakin tinggi temperatur proses yang digunakan maka semakin tinggi juga kekuatan bitumen modifikasi dalam menahan beban serta semakin tinggi ketahanan termalnya. Kompatibilitas yang baik didapat pada penambahan lignin 0,5% dan temperatur proses 180&#deg;C.
<hr><i>ABSTRACT
In the application, road construction still has some weakness such as easily damaged, especially when wet patch of water exists. In this case, it will shorten the lifespan of the road. In this study, therefore, the main purpose is to modify the bitumen, which is the main ingredient of asphalt for road construction. The work was performed by adding high density polyethylene (HDPE) and lignin into the bitumen mix pen 60/70. It was expected that it could decrease the penetration?s value so it will make the asphalt harder and resistant to the load, increase the softening point, and thus lower the ductility. The addition of lignin was expected to function as a coupling agent and could increase the compatibility between HDPE and bitumen. This can be understood since lignin has a polar and a non-polar groups. Concentration of lignin used was 0.1, 0.3, and 0.5 wt.% at processing temperature of 140oC, 160oC and 180oC and mixing times of 15, 30, and 45 minutes. Characterization was performed by using a Fourier Transform Infrared (FTIR), Thermogravimetric Analyzer (TGA), and Differential Scanning Calorimetry (DSC), whereas the mechanical testing of the modified bitumen was performed through ductility testing, penetration, and softening point. The results showed that high level of lignin and high temperature of the process resulted in high strength of the modified bitumen and so does the thermal resistance. The best result was obtained in the addition of 0.5

wt.% lignin at a process temperature of 180°C.</i>;In the application, road construction still has some weakness such as easily damaged, especially when wet patch of water exists. In this case, it will shorten the lifespan of the road. In this study, therefore, the main purpose is to modify the bitumen, which is the main ingredient of asphalt for road construction. The work was performed by adding high density polyethylene (HDPE) and lignin into the bitumen mix pen 60/70. It was expected that it could decrease the penetration?s value so it will make the asphalt harder and resistant to the load, increase the softening point, and thus lower the ductility. The addition of lignin was expected to function as a coupling agent and could increase the compatibility between HDPE and bitumen. This can be understood since lignin has a polar and a non-polar groups. Concentration of lignin used was 0.1, 0.3, and 0.5 wt.% at processing temperature of 140oC, 160oC and 180oC and mixing times of 15, 30, and 45 minutes. Characterization was performed by using a Fourier Transform Infrared (FTIR), Thermogravimetric Analyzer (TGA), and Differential Scanning Calorimetry (DSC), whereas the mechanical testing of the modified bitumen was performed through ductility testing, penetration, and softening point. The results showed that high level of lignin and high temperature of the process resulted in high strength of the modified bitumen and so does the thermal resistance. The best result was obtained in the addition of 0.5 wt.% lignin at a process temperature of 180oC., In the application, road construction still has some weakness such as easily damaged, especially when wet patch of water exists. In this case, it will shorten the lifespan of the road. In this study, therefore, the main purpose is to modify the bitumen, which is the main ingredient of asphalt for road construction. The work was performed by adding high density polyethylene (HDPE) and lignin into the bitumen mix pen 60/70. It was expected that it could decrease the penetration’s value so it will make the asphalt harder and resistant to the load, increase the softening point, and thus lower the ductility. The addition of lignin was expected to function as a coupling agent and could increase the compatibility between HDPE and bitumen. This can be understood since lignin has a polar and a non-polar groups. Concentration of lignin used was 0.1, 0.3, and 0.5 wt.% at processing temperature of 140oC, 160oC and 180oC and mixing times of 15, 30, and 45 minutes. Characterization was performed by using a Fourier Transform Infrared (FTIR), Thermogravimetric Analyzer (TGA), and Differential Scanning Calorimetry (DSC), whereas the mechanical testing of the modified bitumen was performed through ductility testing, penetration, and softening point. The results showed that high level of lignin and high temperature of the process resulted in high strength of the modified bitumen and so does the thermal resistance. The best result was obtained in the addition of 0.5 wt.% lignin at a process temperature of 180oC.]