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Karakteristik degradasi karet alam vulkanisat oleh dimetil eter melalui variasi komposisi filler dan petroleum oil = Degradation characteristics of vulcanized natural rubber by dimethyl ether through variation of filler dan petroleum oil composition / Johan

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Abstrak

ABSTRAK
Dimetil eter (DME) adalah salah satu bahan bakar alternatif terbarukan yang dapat menggantikan pemakaian energi fosil di Indonesia. Penggunaan senyawa ini menghasilkan pembakaran yang efisien serta ramah lingkungan. Akan tetapi, dimetil eter diketahui menyebabkan degradasi pada material karet, yang banyak digunakan sebagai sealant ataupun selang pada tempat penyimpanan bahan bakar dari mesin pembakaran. Hingga penelitian ini, setiap jenis material karet mengalami degradasi yang berbeda-beda sehubungan dengan senyawa ini. Oleh karena itu, penelitian ini utamanya ditujukan untuk menentukan jenis degradasi material karet, khususnya karet alam vulkanisat, terhadap dimetil eter. Selain itu, penelitian ini hendak melihat pengaruh komposisi filler dan petroleum oil dari karet alam vulkanisat terhadap degradasi tersebut. Eksperimen yang dilaksanakan mencakup: sintesis, uji degradasi, karakterisasi mekanis dan morfologi. Nilai komposisi filler yang dipakai untuk sintesis yaitu: 10, 30, dan 60 phr; sedangkan nilai komposisi petroleum oil yang dipakai adalah 0, 10, dan 20 phr. Uji degradasi karet alam vulkanisat dilakukan dengan merendam seluruh sampel dalam pressure vessel yang berisi dimetil eter cair, yang diperoleh dari proses pencairan fasa gasnya. Karakterisasi mekanis yang dilakukan mencakup: % perubahan massa, kekuatan tensile, elongasi maksimum, dan kekerasan. Karakterisasi morofologinya berupa pengamatan langsung dan scanning electron microscopy (SEM). Data-data karakterisasi tersebut menunjukkan bahwa karet alam vulkanisat mengalami degradasi jenis absorpsi dan ekstraksi oleh karena dimetil eter. Adapun penambahan komposisi filler ditemukan dapat mengurangi pengaruh degradasi, sedangkan penambahan komposisi petroleum oil justru memperparah degradasi. Namun demikian, petroleum oil juga dibutuhkan karena dapat membuat distribusi filler merata pada seluruh bagian karet alam vulkanisat. Maka dari itu, dengan meninjau keseluruhan data tersebut, didapatkan bahwa komposisi filler dan petroleum oil yang memberikan perlindungan paling optimal terhadap degradasi oleh dimetil eter masing-masing bernilai 30 phr dan 10 phr.
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ABSTRACT
Dimethyl ether (DME) is one of the renewable energy that could replace the usage of fossil fuel in Indonesia. The usage of this compound could produce efficient and environmental-friendly combustion. However, based on previous research, dimethyl ether is found to cause degradation on rubber-based materials, which are used as sealant or hose inside the fuel tanker of combustion engines. Until this research, it is found that each types of rubber has suffered different kinds of degradation that caused by dimethyl ether. Therefore, the main goal of this research is to determine what kind of degradation will happen on rubber, especially vulcanized natural rubber, that cause by dimethyl ether. Moreover, this research is going to see the effect of filler and petroleum oil composition contained in vulcanized natural rubber against that degradation. There are three parts of experiments will conducted: synthesis, degradation testing, mechanical

and morphology characterization. The variation value of filler composition used are 10, 30, and 60 phr; while the variation value of petroleum oil composition are 0, 10, and 20 phr. Degradation testing is done by immersing all samples inside pressure vessel that have been filled with liquid dimethyl ether, which produced from its gas by liquefaction process. Mechanical characterization that observed includes: % change of mass, tensile strength, maximum elongation, and hardness. On the other side, morphology characterization is done by direct observation and scanning electron microscopy (SEM). Those datas reveals that vulcanized natural rubber suffer absorption and extraction, two types of degradation, because of dimethyl ether. Increasing of filler composition could reduce the impact of degradation, while increasing of petroleum oil composition will give the opposite results. However, it is also found that petroleum still must needed to make distribution of filler goes through all parts of rubber. Therefore, based on these datas, we get that 30 phr of filler and 10 phr of petroleum pil will give the optimal protection on vulcanized natural rubber against degradation caused by dimethyl ether.