Pengaruh Waktu Ekstraksi Terhadap Penurunan Kadar Sulfur pada Proses Desulfurisasi Biosolar = Effect of Extraction Time on Reduction of Sulfur Contents in Desulfurization Process of Diesel Fuel

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Abstrak

Kadar sulfur pada bahan bakar solar di Indonesia masih sangat tinggi saat ini dan jauh lebih tinggi dibanding standar internasional. Tingginya kadar sulfur ini dapat menyebabkan dampak negatif pada mesin kendaraan, kesehatan manusia, dan lingkungan. Untuk mengatasi permasalahan ini, terdapat beberapa metode penurunan kadar sulfur. Salah satu metode yang dianggap paling baik dan banyak diteliti adalah Oxydative Desulfurization (ODS) yang memiliki keunggulan reaksi singkat, kondisi operasi ambien, efisiensi tinggi, tidak memerlukan banyak biaya, dan selektivitas tinggi. Berbagai penelitian terkait ODS dilakukan dengan berbagai kombinasi jenis oksidator, katalis, dan pelarut. Pada penelitian ini, metode ODS dilakukan dengan menggunakan oksidator hidrogen peroksida, katalis asam format, dan pelarut metanol yang telah dilaporkan memiliki kinerja yang paling baik. Proses oksidasi ODS dilakukan dengan mencampur dan mengaduk katalis, oksidator, dan solar dalam suatu wadah pada temperatur 30oC dengan rasio molar katalis/sulfur 4:1 dan rasio molar oksidator/sulfur 3:1. Setelah oksidasi, dilakukan ekstraksi cair-cair dengan pelarut metanol untuk memisahkan sulfur yang telah teroksidasi dari produk solar. Waktu ekstraksi divariasikan dari 10 sampai 40 menit. Kinerja penelitian ini dapat diketahui dengan membandingkan kadar sulfur sebelum dan sesudah ODS. Kadar sulfur dianalisis menggunakan alat FTIR, GCMS, dan ASTM D4294. Hasil uji kemudian akan dianalisis secara kuantitatif untuk memperoleh tingkat desulfurisasi. Dari hasil analisis kuantitatif, didapati bahwa waktu ekstraksi yang menghasilkan persen desulfurisasi tertinggi adalah 10 menit. Tingkat desulfurisasi tertinggi mencapai 70% dengan kadar sulfur dalam biosolar tersisa 120 ppm. ..... Sulfur levels in diesel fuel in Indonesia are still very high today and much higher than international standards. High levels of sulfur can cause negative impacts on vehicle engines, human health, and the environment. To overcome this problem, there are several methods of reducing sulfur content. One of the methods that is considered the best and has been widely studied is Oxidative Desulfurization (ODS) which has the advantages of short reaction time, ambient operating conditions, high efficiency, does not require much cost, and high selectivity. Various studies related to ODS have been carried out with various combinations of oxidizing agents, catalysts, and solvents. In this study, the ODS method was carried out using hydrogen peroxide as an oxidizing agent, formic acid catalyst, and methanol as solvent which has been reported to have the best performance. The ODS oxidation process is carried out by mixing and stirring the catalyst, oxidizing agent, and diesel fuel in a container at a temperature of 30oC with a catalyst/sulfur ratio of 4:1 and a molar ratio of oxidizing agent/sulfur 3:1. After oxidation, a liquid-liquid extraction was carried out with methanol as a solvent to separate the oxidized sulfur from the diesel product. Extraction time was varied from 10 to 40 minutes. The performance of this research can be known by comparing the sulfur content before and after ODS. Sulfur content was analyzed using FTIR, GCMS, and ASTM D4294. The test results will then be analyzed quantitatively to obtain the level of desulfurization. From the results of quantitative analysis, it was found that the extraction time that produced the highest percentage of desulfurization was 10 minutes. The highest desulfurization rate reached 70% with the remaining sulfur

content in biodiesel at 120 ppm.