INTISARI

Graphene merupakan material dua dimensi monoatomik dari satu lapis *graphite* yang tersusun dalam bentuk kisi heksagonal menyerupai sarang lebah. *Graphene* menjadi sangat menarik untuk dikaji karena memiliki beberapa keunggulan dan sifat unik. Dengan keunggulan sifat yang dimilikinya, *graphene* berpotensi besar untuk dikembangkan dalam banyak hal, seperti komponen perangkat elektronik, komposit dan pelapis, material biomedis, dan alat pendeteksi. *Graphene* dapat diperoleh dengan mensintesis material *graphite*. Namun terdapat masalah dalam usaha memperoleh *graphene*. Masalah tersebut adalah tentang bagaimana dapat menghasilkan lembaran *graphene* pada skala yang cukup. Karena meskipun harga *graphite* murah dan tersedia dalam jumlah banyak, *graphite* tidak mudah terkelupas untuk menghasilkan lembaran *graphene*. Oleh karena itu, pada penelitian ini dilakukan optimasi parameter proses sintesis *graphene* berbahan baku serbuk *graphite* untuk memperoleh massa *graphene* optimal. Selain itu, tujuan penelitian ini adalah untuk mengetahui karakterisasi *graphene* yang dihasilkan menggunakan uji spektrofotometri FTIR.

Pada penelitian ini, *graphene* diperoleh dengan mensintesis serbuk *graphite*. Metode sintesis *graphene* yang digunakan adalah metode *liquid exfoliation* (LE) dengan bantuan surfaktan berjenis *sodium dodecyl sulfate* (SDS). Parameter proses yang digunakan adalah waktu proses blender selama 30 menit, 60 menit, dan 90 menit dan waktu sonifikasi selama 60 menit, 90 menit, dan 120 menit. Sementara itu, respons yang diteliti adalah massa *graphene* hasil sintesis. Hasil eksperimen kemudian dioptimasi menggunakan metode *response surface* dengan bantuan *software* Minitab 17 dan Microsoft Excel. Selain itu, juga dilakukan uji karakterisasi *graphene* menggunakan uji spektrofotometri FTIR.

Hasil penelitian menunjukkan kombinasi nilai parameter proses sintesis *graphene* yang optimal adalah waktu proses blender selama 90 menit dan waktu sonifikasi selama 120 menit. Parameter ini menghasilkan massa *graphene* sebanyak 0,1216 gram. Hasil prediksi model terhadap nilai massa *graphene* hasil eksperimen memiliki selisih sebesar 17,35%. Nilai selisih tersebut muncul dapat disebabkan karena faktor seperti adanya nilai *error* pada model yang tidak bisa dikontrol dan perbedaan ketelitian saat melakukan eksperimen sehingga nilai yang dihasilkan berbeda. Berdasarkan hasil uji spektrofotometri FTIR, gugus-gugus fungsional pada *graphene* yang dapat diidentifikasi adalah ikatan O-H, ikatan C-H alifatik, dan ikatan C=C aromatik.

Kata Kunci : *Graphite*, Sintesis *Graphene*, *Liquid Exfoliation* (LE), Waktu Blender, Waktu Sonifikasi, Spektrofotometri FTIR, Metode *Response Surface*.

ABSTRACT

Graphene is a monoatomic two-dimensional material of one graphite layer arranged in the honeycomb-like hexagonal lattice form. Graphene becomes very interesting to study because it has several advantages and unique properties. With the advantages of its properties, graphene has great potential to be developed into many things, such as electronic device components, composites and coatings, biomedical materials, and detection devices. Graphene can be obtained by synthesizing graphite material. However, there is a problem in the process to obtain graphene. The problem is about how to produce graphene sheets at a sufficient scale. Because even though graphite price is cheap and available in large quantities, graphite is not easy to peel off to produce graphene sheets. Therefore, in this research, the optimization of graphene synthesis process parameters using graphite powder as raw material was carried out to obtain optimal graphene mass. Besides, the purpose of this research was to determine the characterization of graphene produced using FTIR spectroscopy test.

In this research, graphene was obtained by synthesizing graphite powder. The graphene synthesis method used was liquid exfoliation (LE) method with the support of sodium dodecyl sulfate (SDS) as surfactant. Parameters of the process were blender processing time for 30 minutes, 60 minutes and 90 minutes and sonification time for 60 minutes, 90 minutes and 120 minutes. Meanwhile, the response studied in this research was the mass of graphene as a result of synthesis. The experimental results then optimized using response surface method with assistance of Minitab 17 and Microsoft Excel software. Besides, the graphene characterization test was also carried out using FTIR spectroscopy test.

The research results showed an optimal combination of parameter values of the graphene synthesis process with the blender processing time for 90 minutes and sonification time for 120 minutes. This parameter produced a graphene mass of 0,1216 grams. The result between model prediction and the graphene mass from experimental result had a difference of 17.35%. The difference arose because of factors such as the existence of error values in the model that cannot be controlled and differences in accuracy when conducting experiment so that the resulting values were different. Based on the FTIR spectroscopy test results, functional groups in graphene that can be identified were O-H bonds, C-H aliphatic bonds, and C=C aromatic bonds.

Keywords : Graphite, Graphene Synthesis, Liquid Exfoliation (LE), Blender Time, Sonification Time, FTIR Spectroscopy, Surface Response Method.