

ABSTRAK

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Judul : Sintesis *Carbon Nanodots* dari Teh Hitam dengan Urea sebagai Agen Pasivasi menggunakan Metode *Microwave*

Telah dilakukan penelitian tentang sintesis *carbon nanodots* (C-Dots) dari teh hitam ditambah urea sebagai agen pasivasi menggunakan metode pemanasan gelombang mikro (*microwave*). Tujuan penelitian ini diantaranya untuk mensintesis C-Dots berbahan dasar teh hitam ditambah urea dengan metode pemanasan *microwave*, mengetahui pengaruh penambahan urea pada sintesis C-Dots dari teh hitam, mengetahui sifat dan karakteristik dari C-Dots teh yang disintesis. Dilakukan dua jenis sintesis C-Dots yaitu dengan variasi waktu pemanasan (8, 10, 13, 16, 19, 22, 24, 26, 28 dan 30 menit) serta variasi massa urea yang digunakan (0; 0,5; 1; 1,5; 2; 2,5; 3, dan 3,5 gram). Sifat-sifat optik C-Dots dikarakterisasi dengan cara pengamatan pendaran di bawah sinar UV, spektroskopi fotoluminesensi, spektroskopi UV-Vis (absorbansi), dan spektroskopi FTIR (transmitansi). Berdasar hasil spektroskopi PL, C-Dots variasi waktu menunjukkan pendaran berwarna biru kehijauan dengan intensitas fotoluminesensi berkisar antara 148,30 – 446,72 a.u di rentang panjang gelombang 390-425 nm. Dengan intensitas tertinggi dihasilkan dari C-Dots dengan waktu pemanasan 24 menit, yaitu 446,72 a.u pada panjang gelombang 420 nm. Sedangkan intensitas fotoluminesensi C-Dots variasi urea berkisar antara 24,53-117,06 a.u. di panjang gelombang 385-426 nm, dimana intensitas tertinggi dihasilkan C-Dots dengan 3 gram urea, yaitu 117,06 a.u di panjang gelombang 415 nm. Spektroskopi UV-Vis menunjukkan bahwa absorpsi C-Dots paling banyak terjadi di rentang panjang gelombang 200-400 nm dengan puncak yang mengalami pergeseran seiring dengan penambahan lama waktu pemanasan serta penambahan urea. Dari spektrum UV-Vis diketahui energi gap C-Dots variasi waktu berkisar antara 2,240-2,688 eV dengan ukuran partikel 4,344-

4,813 nm. Sedangkan C-Dots variasi massa urea memiliki energi gap 2,122-2,641 eV dengan ukuran partikel 4,425-4,948 nm. Spektrum FTIR C-Dots variasi urea menunjukkan adanya gugus fungsi hidroksil (OH) atau ammonia (N-H), ikatan senyawa aromatik, $C\equiv C$, $C=C$, dan C-O. Urea bekerja sebagai agen pasivasi permukaan sehingga mempengaruhi sifat optik serta struktur C-Dots yang terbentuk.

Kata Kunci: *carbon nanodots* (C-Dots), teh hitam, urea, gelombang mikro.



ABSTRACT

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Title : *Synthesis of Carbon Nanodots from The Black with Urea as a Passivation Agent using the Microwave Method*

Research has been carried out on the synthesis of carbon nanodots (C-Dots) from black tea plus urea as a passivation agent using the microwave heating method. The aims of this study were to synthesize C-Dots made from black tea plus urea using the microwave heating method, analyze the effect of adding urea on the synthesis of C-Dots from black tea, to determine the nature and characteristics of the synthesized tea carbon nanodots. Two types of C-Dots synthesis were carried out, namely with variations in heating time (8, 10, 13, 16, 19, 22, 24, 26, 28 and 30 minutes) and variations in the mass of urea used (0; 0,5; 1; 1,5; 2; 2,5; 3, and 3,5 grams). The optical properties of C-Dots were characterized by observing luminescence under UV light, photoluminescence spectroscopy, UV-Vis spectroscopy (absorbance), and FTIR spectroscopy (transmittance). Based on the result of PL spectroscopy, C-Dots synthesized with variation of time show a turquoise glow with photoluminescence intensity in the range of 148,30 – 446,72 a.u in the wavelength range of 390-425 nm. The highest intensity produced by C-Dots with a heating time of 24 minutes, namely 446,72 a.u at a wavelength of 420 nm. Meanwhile, the photoluminescence intensity of C-Dots varies with urea, ranging from 24,53-117,06 a.u. at a wavelength of 385-426 nm, where the highest intensity was produced by C-Dots with 3 grams of urea, namely 117,06 a.u at a wavelength of 415 nm. UV-Vis spectroscopy showed that most absorption of C-Dots occurred in the wavelength range of 200-400 nm with peaks that shifted with increasing heating time and adding urea. From the UV-Vis spectrum, it is known that the energy gap of C-Dots varies with time ranging from 2,240-2,688 eV with a particle size of 4,344-4,813 nm. Meanwhile, the C-Dots mass variation of urea has an energy gap of 2,122-2,641 eV with a particle size of 4,425-4,948 nm. The FTIR

C-Dots spectrum of urea variation shows the presence of hydroxyl (OH) or ammonia (N-H) functional groups, C≡C, C=C aromatic compounds bonding, and C-O. Urea works as a surface passivation agent so that it affects the optical properties and the structure of the C-Dots formed.

Keyword: carbon nanodots (C-Dots), black tea, urea, microwave.

