

INTISARI

KAJIAN SIFAT OPTIK PADA LAPISAN TIPIS REDUCED GRAPHENE OXIDE/PCBM (FENIL-C61-BUTYRIC ACID METHYL ESTER)

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Telah dilakukan kajian sifat optik lapisan tipis *reduced graphene oxide* (rGO) doping *fenil-C61-butyric acid methyl ester* (PCBM). Pengkajian sifat optik pada penelitian ini dilakukan melalui penentuan indeks bias kompleks ($\tilde{N} = n + ik$), konstanta dielektrik real dan imajiner (\mathcal{E}_1 dan \mathcal{E}_2) dan nilai *optical conductivity* bagian real (σ_1). *Reduced graphene oxide* dibuat menggunakan metode *Hummer* dan lapisan tipis rGO/PCBM dibuat menggunakan teknik *spin coating* di atas substrat *quartz*. Proses pemberian doping PCBM pada larutan rGO dilakukan secara kimia dengan mencampurkan PCBM sebesar 0.05 ml, 0.1 ml, 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml dan 1 ml ke larutan rGO dengan bantuan surfaktan *tween* sebagai perekat air dan *dichlorobenzene* yang masing-masing merupakan pelarut rGO dan PCBM. Karakterisasi pada penelitian menggunakan FTIR, Raman dan dikombinasikan dengan data absorbansi untuk menentukan karakteristik optik dari material. Besaran indeks bias kompleks telah berhasil diekstrak menggunakan analisis *Kramers-Kronig*. Penambahan konsentrasi PCBM menyebabkan profil dari nilai koefisien ekstingsi (k), nilai \mathcal{E}_2 dan nilai σ_1 menurun, dari rentang 1,5 sampai 6,2 eV. Namun pada rentang energi 1,5-3,0 eV terlihat penurunan nilai k dan \mathcal{E}_2 yang cukup signifikan. Sedangkan pola perubahan nilai n dan \mathcal{E}_1 dengan penambahan PCBM dibagi menjadi 3 bagian yaitu pola perubahan bagian rentang energi rendah pada 1,5-2,7 eV, rentang energi sedang pada 2,8-5,0 dan rentang energi tinggi pada 5,1-6,2. Sementara melalui analisis *effective medium approximation* (EMA) menggunakan persamaan *Bruggeman* didapatkan udara, air, rGO, GO dan *dichlorobenzene* dalam komposit lapisan tipis material. Nilai k yang semakin turun dari rentang 1,5 sampai 6,2 eV menunjukkan bahwa lapisan tipis *reduced graphene oxide* semakin transparan dengan penambahan PCBM, sementara nilai σ_1 juga menurun pada rentang yang sama sehingga berpotensi diaplikasikan sebagai bagian aktif sel surya organik.

Kata Kunci : *Graphene Oxide, Spin coating, konstanta optik, Kramers-Kronig.*

ABSTRACT

Study of Optical Properties of Reduced of Graphene Oxide/PCBM (Fenil-c-61-Butyric Acid Methyl Ester) Thin Film

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We report on how the effect of fenil-C₆₁-butyric acid methyl ester (PCBM) on optical properties of reduced graphene oxide thin film. Assessment optical properties of this research by determining the complex refractive index ($\tilde{N} = n + ik$), real and imaginary dielectric constants (\mathcal{E}_1 and \mathcal{E}_2) and the value of the real of optical conductivity (σ_1). Graphene oxide has been prepared by oxidizing purified natural flake graphite via modified Hummers method and has been reduced graphene oxide thin film doped by PCBM has been fabricated by using spin coating technique. PCBM doped process of giving a solution of rGO performed chemically by mixed PCBM of 0.05 ml, 0.1 ml, 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml and 1 ml solution to rGO with the aid of a surfactant tween as adhesive water and dichlorobenzene, each of which is a solvent rGO and PCBM. The samples were characterized by FTIR, Raman and combined with the data absorbance to determined the optical characteristics of the material. The magnitude of the complex refractive index has been successfully extracted used Kramers-Kronig analysis. The addition of PCBM concentration led to the profile of the value of extinction coefficient (k), \mathcal{E}_2 value and the value σ_1 are decreased, from the range of 1.5 to 6.2 eV. But the energy range 1.5-3.0 eV noticeable decrease in the value of k and \mathcal{E}_2 significant. While the change in the value of n and \mathcal{E}_1 with the addition of PCBM is divided into 3 regions. The first area is in the range from 1.5 to 2.7 eV energy, the second region is in the range from 2.8 to 5 eV and the third area is in the range from 5.1 to 6.2 eV. While going through the analysis of effective medium approximation (EMA) got air, water, rGO, GO and dichlorobenzene in a thin film of composite material. K values were getting down from the range of 1.5 to 6.2 eV showed that reduced graphene oxide thin film more transparent with the addition of PCBM, while the value σ_1 also decreased in the same range, thereby potentially as active cell on organic solar cell.

Key words: Graphene oxide, spin coating, optical constants, Kramers-Kronig.