INTI SARI

Aplikasi SWCNT di dunia medis sudah luas digunakan baik di bidang biologi molekuler dan obat-obatan. SWCNT cenderung bersifat *hidrofobik* dan membentuk aglomerat yang disebabkan karena adanya gaya *Van der Waals* yang cukup besar antar partikel. Hal ini menyebabkan rendahnya kelarutan dan dispersi CNT di dalam sistem transportasi dan luas permukaannya yang kecil. Penelitian ini bertujuan untuk mengetahui pengaruh dari perbedaan metode fungsionalisasi pada morfologi dan sifat kimia-fisika serta menentukan model kinetika dan kesetimbangan adsorpsi. Fungsionalisasi SWCNT dilakukan dalam beberapa langkah yaitu oksidasi, penyaringan, pencucian, dan pengeringan. Oksidasi dilakukan menggunakan campuran asam nitrat, asam sulfat, dan campuran keduanya pada suhu ruangan.. Karakterisasi sampel dianalisis menggunakan metode titrasi *Boehm*, spektroskopi FTIR, SEM-EDX, TGA, BET, dan uji dispersi. Hasil analisis menunjukkan bahwa gugus karboksil telah berhasil melekat pada SWCNT melalui oksidasi dengan campuran asam nitrat dan asam sulfat baik dengan metode pengadukan dan sonikasi. Model kinetika adsorpsi kurkumin terhadap adsorben SWCNT terfungsionalisasi mengikuti model kinetika *pseudo* orde-2. Model kesetimbangan adsorpsi kurkumin terhadap adsorben SWCNT terfungsionalisasi mengikuti model kesetimbangan *Freundlich* dengan mekanisme adsorpsi fisika atau fisiosorpsi. hasil luas permukaan dari SWCNT terfungsionalisasi sebesar 272,771 (m^2/gram), kapasitas adsorpsi maksimum berdasarkan model kesetimbangan sebesar 14,956 mg/gram. Urutan kecepatan adsorpsi adalah sampel murni > sampel H > sampel K. Untuk mendukung hasil eksperimen, pemodelan dengan kimia komputasi dilakukan. Hasilnya adalah pemodelan kimia komputasi DFT B3LYP dengan basis set 3-21G mampu menggambarkan kondisi hasil eksperimen seperti kestabilan dan energi ikat.

Kata kunci: *SWCNT, Fungsionalisasi, Kinetika, Kurkumin, Adsorspsi*

ABSTRACT

Application of SWCNT in the medical world is already widely used in the fields of molecular biology and drugs. SWCNT have hydrophobic properties and form agglomerates due to the presence of Van der Waals interactions between particles. This leads to the low solubility and dispersion of CNT in the transportation system and its surface area is small. This study aims to determine the effect of the difference in the method of functionalization on the morphology and properties of chemical-physics and to determine the kinetic model and the equilibrium of adsorption. Functionalization SWCNT was done in several steps such as oxidation, filtration, washing, and drying. Oxidation was performed using a mixture of nitric acid, sulfuric acid, and a mixture of both at room temperature. The characterization of the samples was investigated by titration *Boehm*, spectroscopy, FTIR, SEM-EDX, TGA, BET, and dispersion test. The results of the analysis showed that the carboxyl group have been successfully attached to the SWCNT through oxidation with a mixture of nitric acid and sulfuric acid either the method of stirring or sonication. The kinetics of the adsorption of curcumin on the adsorbent SWCNT functionalized follows the model of pseudo second order. The adsorption isotherm of curcumin on the adsorbent SWCNT functionalized follows the *Freundlich* model. The results of the surface area of SWCNT functionalized is 272,771 (m^2/gram), the maximum adsorption of curcumin based on the model of *Freundlich* model is 14,956 mg/gram. The order of the rate of the adsorption is pristine sample > sample H > sample K. To support the experimental results, modeling with computational chemistry was carried out. The result is that the computational chemistry modeling of DFT B3LYP with a basis set of 3-21G is able to describe experimental conditions such as stability and binding energy.

Keywords: *SWCNT, Functionalization, Kinetics, Curcumin, Adsorpsi*