Sintesis carbon nanotube menggunakan kamper dengan SS 316 sebagai substrat katalitik melalui preparasi oxidative heat treatment = Synthesis of carbon nanotube using camphor with SS 316 as catalytic substrate through oxidative heat treatment preparation method

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Abstrak

Reaktor berbahan stainless steel tipe 316 SS 316 dirancang untuk sintesis Carbon Nanotube CNT berbasis kamper. Sebagai sumber karbon, padatan kamper diubah menjadi gas melalui proses sublimasi. Sintesis CNT pada permukaan substrat melalui metode sintesis chemical vapor deposition CVD. Sintesis dilakukan dengan substrat pelat SS 316 dan menggunakan argon sebagai carrier gas serta hidrogen sebagai co-reactant. Preparasi substrat dilakukan melalui pretreatment dengan cara dipanaskan dalam kondisi oksidatif oxidative heat treatment pada suhu 850oC selama 30 menit. Tujuan preparasi ini untuk menghilangkan lapisan krom dan membuat permukaannya menjadi lebih kasar sehingga CNT dapat tumbuh. Suhu sintesis yang digunakan adalah 800oC dengan waktu 60 menit. Penelitian dilakukan dengan memvariasikan jumlah massa kamper sebesar 5, 7, 10, 12, dan 15 gram.
Hasil sintesis di karakterisasi menggunakan FESEM-EDS, TEM, dan XRD serta gas hasil dekomposisi kamper dianalisa dengan GC-FID. Hasil karakterisasi menunjukkan CNT tumbuh pada permukaan substrat pelat SS 316 untuk setiap variasi. CNT telah tumbuh mengikuti model tips growth dengan ditemukan juga deformasi berupa buckling growth dan continuous growth. Kualitas dan yield terbaik diperoleh pada jumlah massa kamper 15 gram dengan persentase karbon sebesar 87,1 dan diameter 33 ndash; 44 nm.
<hr>Reactor, which made from stainless steel 316 SS 316, was designed for synthesis of Carbon Nanotube CNT based camphor. As a carbon source, solid camphor was converted into gas through a sublimation process. Synthesis of CNTs on substrate surfaces was through chemical vapor deposition CVD method. Synthesis was performed with stainless steel 316 type as catalyst, argon as carrier gas, and hydrogen as co reactant. Preparation of the catalyst is through a pretreatment by heating under oxidative conditions oxidative heat treatment at a temperature of 850oC for 30 minutes. to remove the layer of chrome and make a rough surface so that CNTs can be grown. Produced CNT will be characterized using SEM, TEM, and XRD while the output gas will be analyzed by Gas Chromatography. The operating temperature of the synthesis used was 800oC with a reaction time of 60 minutes. This research was conducted by varying the number of camphor mass by 5, 7, 10, 12, and 15 grams. Produced CNTs were characterized using FESEM EDS, TEM, and XRD while camphor decomposition gas was analyzed by GC FID.
The characterization results showed that the CNT grows on the surface of the SS 316 plate for each variation. CNTs have grown by follow tips growth model with deformations like buckling growth model and continuous growth model were also founded. The best quality and yield of CNT was obtained at camphor mass of 15 grams with carbon percentage of 87,1 and diameter 33 44 nm.