Identifikasi carbon loss pada produksi carbon nanotube (CNT) skala pilot menggunakan reaktor gauze = Identification of carbon loss during pilot scale of carbon nanotube (CNT) production by gauze reactor

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Abstrak

ABSTRAK
Carbon loss dengan besar lebih dari 65% menjadi kendala utama dalam produksi CNT skala pilot menggunakan reaktor gauze. Identifikasi carbon loss dilakukan dengan menganalisis kemungkinan penyebab carbon loss seperti error pada pengukuran laju alir produk, evaluasi perubahan laju alir umpan karena adanya katalis dan penumbuhan CNT dalam reaktor, analisis komposisi gas produk dengan GC FID dan kemungkinan terbawanya karbon sebagai partikulat dalam aliran produk. Hasil penelitian menunjukkan bahwa carbon loss awal sebelum dianalisis dengan metoda diatas jauh lebih kecil dari penelitian sebelumnya yaitu 27,64%. Hal ini dikarenakan laju alir umpan telah dikalibrasi dengan kondisi reaktor berisi katalis bukan reaktor kosong. Carbon loss mencapai 69,14% jika laju umpan yang digunakan pada perhitungan adalah hasil kalibrasi saat reaktor kosong. Adanya katalis menyebabkan laju alir umpan yang masuk lebih kecil 28% dari saat kondisi kosong. Error laju alir produk karena pengukuran dengan bubble soap memberikan error perhitungan carbon loss ± 4,14%. Perubahan laju alir umpan karena penumbuhan CNT dalam reaktor mengurangi besarnya carbon loss sebanyak 4,97%. Sedangkan terdeteksinya hidrokarbon skunder dengan GC FID selama produksi CNT berlangsung mengurangi carbon loss sebesar 5,41%. Selain itu, partikulat yang terbawa oleh aliran produk sangat sedikit dan hanya mengoreksi carbon loss sebesar 0.05%.Dengan memperhitungkan semua faktor diatas, besarnya carbon loss pada penelitian ini adalah (16,23 ± 4,14)%. Jika diasumsikan 4,14% carbon loss disebabkan oleh error selama pengukuran laju produk maka besarnya carbon loss adalah 12,09% . Artinya lebih dari 57% carbon loss pada penelitian ini telah teridentifikasi.
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Abstract
Carbon loss by more than 65% was the major obstacles to the pilot-scale production of CNTs using gauze reactor. Therefore in this study, to be identified by analyzing the possible causes of carbon loss, such as error of product flow rate due to measurement of bubble soap and possible of feed flow rate changes due to the catalyst presence and the CNT growth in the reactor, analysis of product composition by GC FID and analysis the possibility of particulate carbon in gas products was identified too by using glass fiber filters. The results showed that the initial carbon loss calculation before prior to be analized by the above method was much smaller than previous studies, namely 27.64%. This is because feed flow rate has been calibrated with the condition of the reactor containing the catalyst instead of an empty reactor. Carbon loss will reach 69.14% if the feed rate used in the calculation was calibration results when the reactor is empty.

This is because the catalyst in the reactor led to feed flow rate less 28% of the total discharge current when the empty reactor. Product flow rate error due to measurement of bubble soap give error in the carbon loss calculation up to ± 4.14%. Changes in feed flow rate because the growth of CNTs in the reactor reduce the amount of carbon loss as much as 4.97%. While the detection of secondary hydrocarbons by GC FID during CNT production reduces carbon loss up to 5,41%. In addition, particulate matter carried by the flow of products is very little and only give carbon loss corrected for 0.05%. Taking into account all the factors above, the amount of carbon loss in this study were 16.23 ± 4.14%. If we assume 4,14& carbon loss was caused by error occurred during the study, the amount of carbon loss is 12.09%. This means that more than 57% carbon loss in this study have been identified.