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# 단일벽 탄소나노튜브의 대량 처리가능한 비파괴적 정제기술

# Scalable and Nondestructive Purification of Single-walled Carbon Nanotubes

곽정춘, Tan Soon Huat, 이내성†, 박주혁*

세종대학교 공과대학 나노공학과, *세종대학교 공과대학 기계공학과

(nslee@sejong ac kr†)

Single-walled carbon nanotubes (SWCNTs) are currently produced together with some contaminants such as a metallic catalyst, amorphous carbon, and graphitic nanoparticles, which should be sometimes purified for their applications Such impurities are usually removed by destructive methods, which also simultaneously damaged SWCNTs This study aimed to develop efficient, scalable purification processes but less harmful to SWCNTs We designed a three-step purification method acidic treatment, functionalization, soxhlet extraction First, as-produced SWCNTs by arc discharge were treated with a 3 M nitric acid to remove the catalytic metal and to destroy spherical graphitic nanoparticles It was observed that the nanoparticles were seriously damaged by the acid treatment, which produced residues to probably result in agglomeration of SWCNTs In the nitric acid treatment, carboxylic groups could be introduced to defect sites of SWCNTs and carbon impurities Functionalization was conducted such that hexadecyl amine formed ionic bonds with carboxyl groups on carbon impurities as well as SWCNTs by a condensation reaction A long-chain alkyl group seemed to play an important role in making the functionalized carbon impurities soluble in organic solvents, in particular, tetrahydrofuran During the soxhlet extraction using tetrahydrofuran, therefore, carbon impurities could be easily expelled through a glass thimble filter without any significant loss of CNTs SWCNTs were left as a bulky paper on the filter The organic groups in SWCNTs were burned out to produce as pure SWCNTs as possible The yield measured from the starting and final weights of SWCNTs was ~14 % Purified SWCNTs were characterized using scanning electron microscopy, Raman spectroscopy, and thermogravimetric analysis