

課題番号 : F-13-UT-0066  
利用形態 : 機器利用  
利用課題名 (日本語) : 架橋カーボンナノチューブの発光に対するオゾン暴露の影響  
Program Title (English) : Effects of ozone exposure to air-suspended carbon nanotubes  
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## 1. 概要 (Summary)

In the framework of this project work the aim was to investigate the ozone effects on air-suspended single-walled carbon nano tubes by exposing them to an atmosphere of oxygen and ozone.

It was expected to observe a change in photoluminescence signal from those CNTs compared to pristine CNTs of the same chirality. Therefore PLE measurements have been conducted before and after the ozone exposure to have comparable results and to investigate the effect of ozone exposure on the observed PLE data.

## 2. 実験 (Experimental)

The substrate on which the CNTs are grown have been prepared in the cleanroom using the stealth dicer, the F5512 e-beam writer and Alcatel ICP etcher. The nanotubes were grown by CVD.

To clarify the chirality of the CNTs before the ozone exposure, PLE measurements on several CNTs were performed. Within this measurement, the position of each CNT on the chip was investigated and PLE measurements have been performed.

To expose the sample to ozone it was put into a device. The sample is put into the sample quartz tube upside down. Then the tube gets covered with aluminum foil during the exposure. The system gets filled with oxygen up to the experiment pressure  $p$ . A UV light lamp shines on the UV quartz tube for  $x$  minutes, which is filled with pure oxygen and leads into the creation of ozone.

The amount of created ozone can be controlled by the two parameters  $x$  and  $p$ . After that, the sample gets illuminated by a white light torch for  $t$  minutes.

To investigate the effect of ozone exposure at a certain triplet of parameters, PLE measurements and the change of PL Signal with Laser light irradiation time were performed.

## 3. 結果と考察 (Results and Discussion)

The exposure of pure oxygen already quenches at PL signal of air-suspended CNTs. Therefore the initial cleaning process in the procedure of ozone exposure had to be skipped.

At a certain condition, ( $p=1$  [pa],  $x=10$  [min],  $t= 20$  [min]) peaks with unidentifiable chirality had been found, which could be successfully doped CNTs.

A time depended effect to the PL signal at the resonant excitation wavelength caused by oxygen exposure at 1 pascal have been found, displayed in Figure 1.

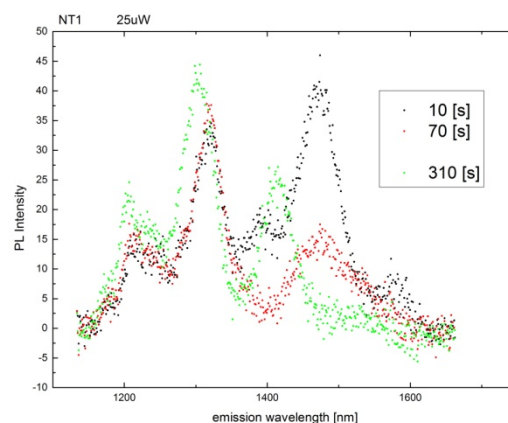


Fig. 1 Exposure time dependence of PL.

## 4. その他・特記事項 (Others)

なし。

## 5. 論文・学会発表 (Publication/Presentation)

なし。

## 6. 関連特許 (Patent)

なし。