

## Accepted Manuscript

Title: A new understanding of carbon nanotube growth:  
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PII: S0169-4332(15)00142-7  
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2015.01.117>  
Reference: APSUSC 29554

To appear in: *APSUSC*

Received date: 13-11-2014  
Revised date: 12-1-2015  
Accepted date: 18-1-2015



Please cite this article as: Y. Zhang, B. Wang, Q. Yu, A new understanding of carbon nanotube growth: different functions of carbon species, *Applied Surface Science* (2015), <http://dx.doi.org/10.1016/j.apsusc.2015.01.117>

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# A new understanding of carbon nanotube growth: different functions of carbon species

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**ABSTRACT:** To understand of the formation mechanism of carbon nanotubes (CNTs) from carbon source is critical for controlled-production of CNTs. In this study, the functions of carbon species was investigated by a thermogravimetric analyzer coupled with a mass spectroscope in use of methane as carbon source of CNT growth in chemical vapor deposition (CVD). It was found that a negative peak of C<sub>2</sub>H<sub>2</sub> species and a positive peak of C<sub>2</sub>H<sub>4</sub> species appeared at the CNT growth moment. It accordingly is deduced that the C<sub>2</sub>H<sub>2</sub> species reacts on nucleation and C<sub>2</sub>H<sub>4</sub> species reacts on CNT growth. This deduction is then verified by the computational chemistry results based on density functional theory (DFT). This finding clarifies the different functions of C<sub>2</sub> at growing moment at the first time and makes the controlling of CNT production in such condition become promising.

## Keywords

Chemical vapor deposition; Carbon nanotubes; Interface dynamics; Carbon species; Function

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