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In-situ calorimetric studies of SWCNT growth OLEG KUZNETSOV, TOSHIO TOKUNE, ELENA MORA, GUGANG CHEN, AVETIK HARUTYUNYAN, Honda Research Institute USA Inc. — Single-walled carbon nanotubes (SWCNTs) were grown inside of a differential scanning calorimetry (DSC) apparatus with an attached mass spectrometer (MS), using different hydrocarbons (CH_4 and C_2H_4) and alumina supported (Fe, Fe/Mo, and Ni) catalysts. This set-up allowed to *in situ* follow the evolution of calorimetric, thermogravimetric and MS data during the synthesis. A Raman spectrometer (with laser excitations wavelengths 532 and 785 nm) was used for verification of the growth of SWCNTs. DSC studies at temperatures ∼650-900 $^\circ$C of the interaction between the hydrocarbons and the preliminary reduced alumina supported catalysts showed a release (C_2H_4) or absorption (CH_4) of heat depending on the type of hydrocarbon used. The effect of this energy on the growth of SWCNTs was studied. We found that the incubation time for nanotube nucleation depends on the hydrocarbon type and flow rate, as well as on the synthesis temperature. The origin of the initial endothermic peak observed during nanotube growth with both hydrocarbon sources will be discussed. Furthermore, the kinetics and thermodynamic of hydrocarbon decomposition, carbon atoms diffusion and solid carbon structure formation dependence on the catalyst and synthesis parameters will also be presented.

Oleg Kuznetsov
Honda Research Institute USA Inc.

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