Supporting Information

High-Strength Carbon Nanotube/Carbon Composite Fibers by Chemical Vapor Infiltration

Jaegeun Lee,[1,†] Teawon Kim,[2,†] Yeonsu Jung,[3] Kihoon Jung,[1] Junbeom Park,[1,2] Dong-Myeong Lee,[1,4] Hyeon Su Jeong,[1] Jun Yeon Hwang,[1] Chong Rae Park,[3] Kun-Hong Lee,[2,] and Seung Min Kim[1,*]*

[1]Institute of Advanced Composite Materials, Korea Institute of Science and Technology, 92 Chudong-ro, Bongdong-eup, Wanju-gun, Jeonbuk 55324, South Korea

[2]Department of Chemical Engineering, Pohang University of Science & Technology, 77 Cheongam-ro, Nam-gu, Pohang, Gyeongbuk 37673, South Korea

[3]Carbon Nanomaterials Design Laboratory, Research Institute of Advanced Materials, and Department of Materials Science and Engineering, Seoul National University, Seoul 151-744, South Korea

[4]Department of Chemistry, Chonbuk National University, Baekje-daero 567, Deokjingu, Jeonju, Jeonbuk, 54896, South Korea

†These authors contributed equally.

*Corresponding author.

E-mail address: ce20047@postech.ac.kr (K. –H. Lee), seungmin.kim@kist.re.kr (S. M. Kim)

1. Pressure equilibrium constants of decomposition of various hydrocarbons

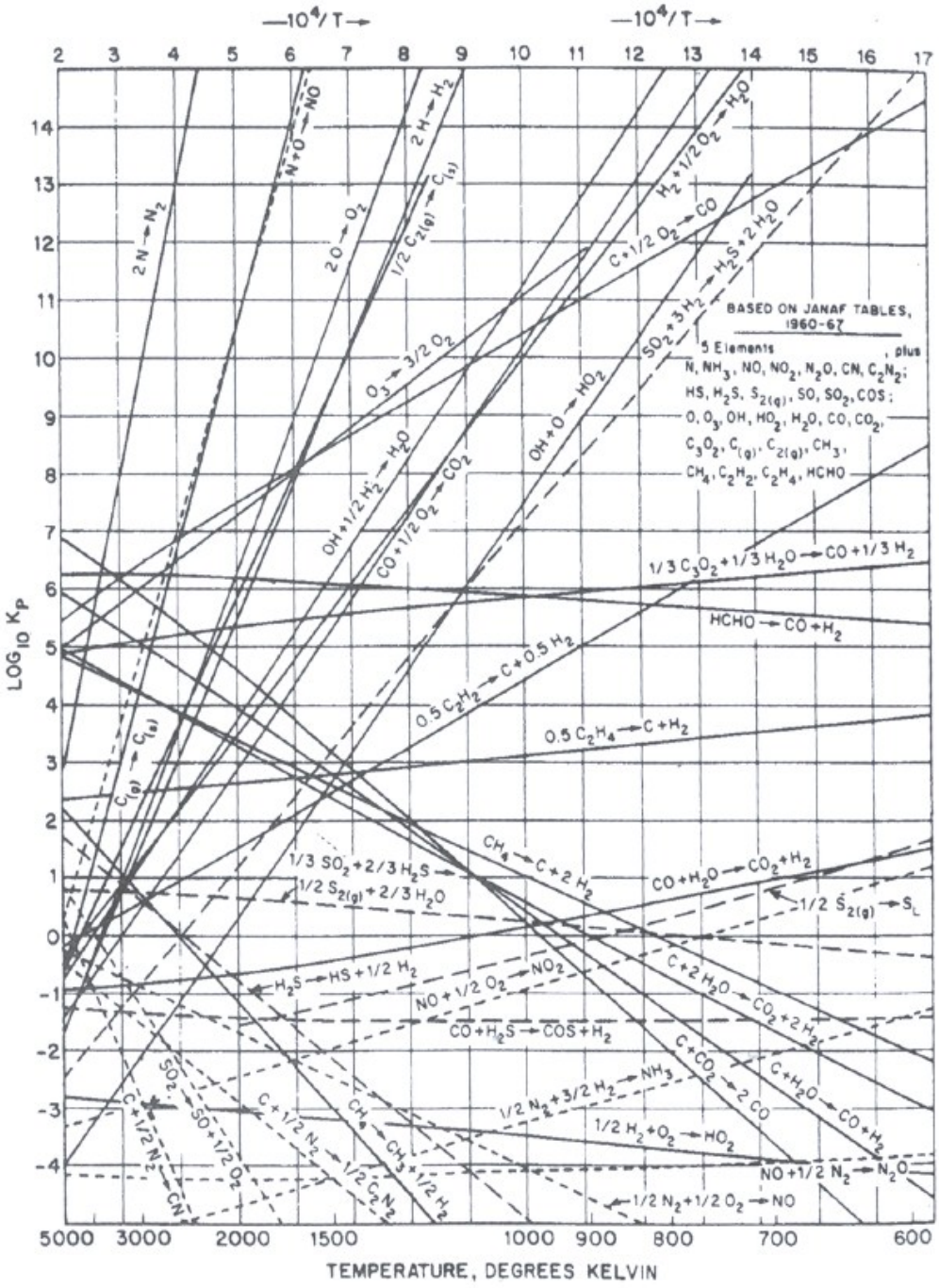

Fig S1. Pressure equilibrium constants of various chemical reactions with respect to temperature.[1]

2. Calculation of Reynolds number

When the flow rate was 3700 cm^3, the Reynolds number is

$$Reynolds\ number\ in\ the\ tube$$
$$= \frac{\rho v d}{\mu} = \frac{v d}{\nu} = \frac{Q d}{A \nu} = \frac{3700\ cm^3 min^{-1} \times 10^{-6}\, m^3 cm^{-3} \times \frac{1}{60} \text{min}}{117.8 \times 10^{-6}\, m^2 s^{-1} \times \pi \times (3 \times}$$
$$= 11$$

Where ρ is the density of the gas, v is the flow velocity, d is the diameter of the tube, μ is the viscosity of the gas, ν is the kinematic viscosity, Q is the flow rate, and A is the cross-sectional area of the tube.

3. Cross sections of CNT/C composite fibers

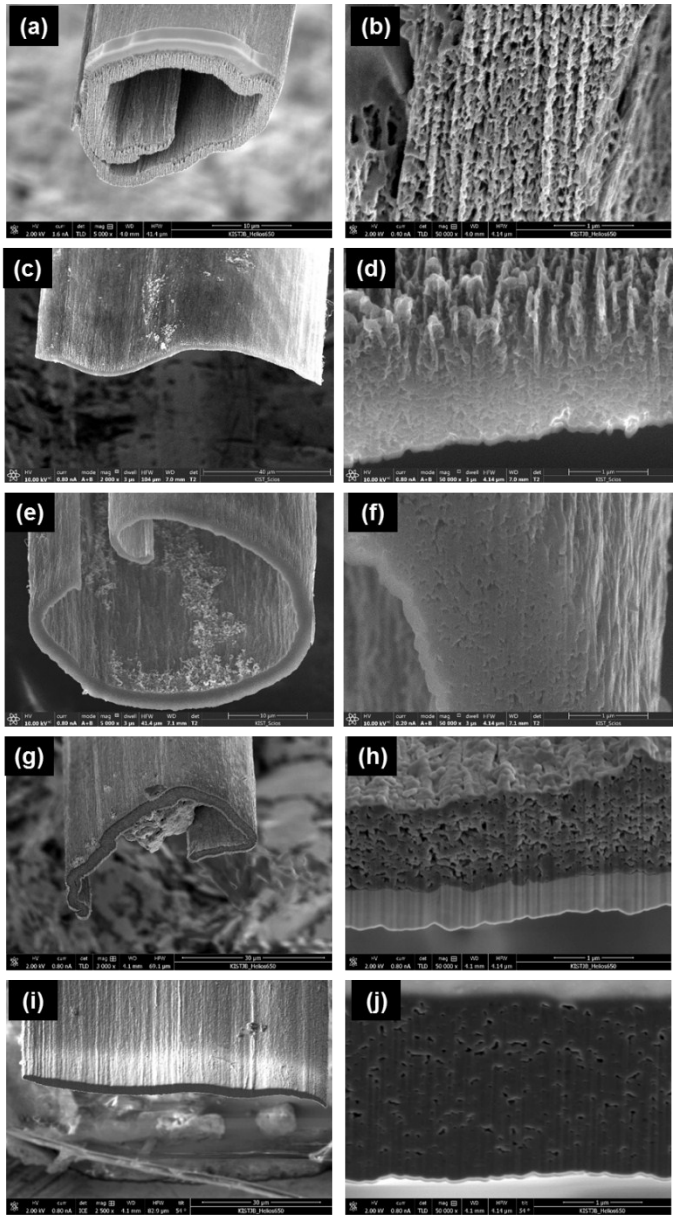

Fig. S2. Cross-sectional SEM images of (a)-(b) pristine CNT yarn, CNT yarn after CVI process (c)-(d) at 700 °C for 1 hour, (e)-(f) at 700 °C for 5 hours, (g)-(h) at 650 °C for 5 hours, and (i)-(j) at 750 °C for 5 hours

Reference

1. Modell, M.; Reid, R. C., *Thermodynamics and Its Applications*. Prentice-Hall: Upper Saddle River, N.J., 1983.