Polyurethane foam reinforced with CNT addition for sound absorption materials

Jun han Shin, Jae ik Park, Seung heon Lee, Jung Hyeun Kim*

Department of Chemical Engineering, University of Seoul, Seoul, Korea

Introduction

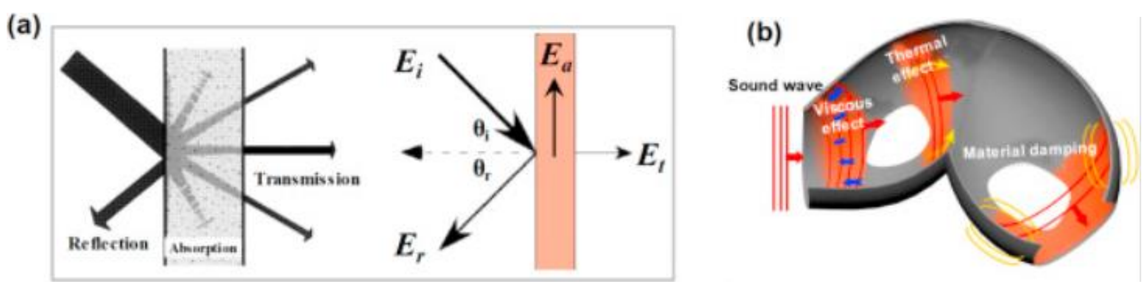

Figure 1. (a) Schematic of the sound absorption process for porous materials (b) Schematic diagram showing the energy consumption mechanisms of porous sound absorption materials.

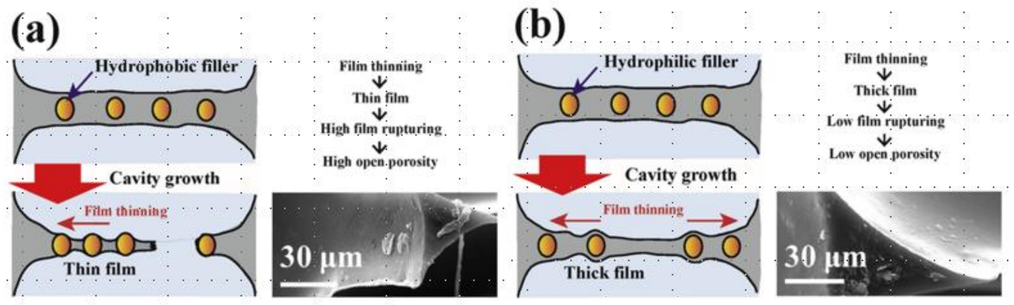

Figure 2. Schematic illustrations of formation mechanisms of cavity and pores depending on the surface natures of inorganic fillers.

Experimental

Table 1. Formulation of PU foams as function of MWCNT filler contents.

Materials		Fomulation (g)
Polyol System	Polyol (PPG-6000)	100
	Gelling Catalyst (33LV)	0.72
	Blowing Catalyst (BL17)	0.08
	Chain extender (DEA)	0.60
	Blowing agent (H_2O)	4.00
	Surfactant (L-3002)	1.32
Isocyanate*	CG3701S	57.28
Filler	MWCNT	0 0.01 0.03 0.05 0.07 0.1 0.15 0.2

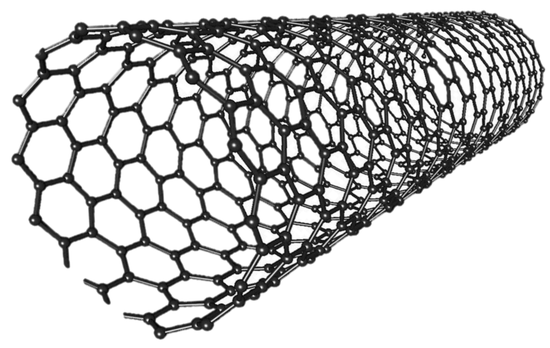

Figure 3. Schematic illustrations of formation mechanisms of cavity and pores depending on the surface natures of inorganic fillers.

Results & Discussion

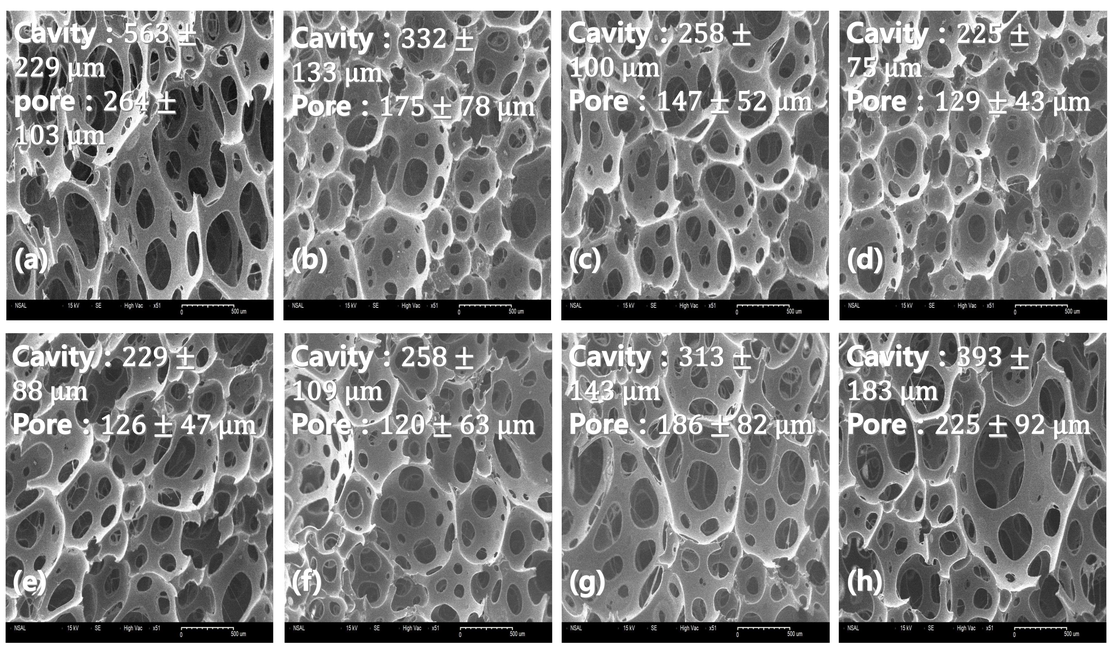

Figure 4. SEM images of PU/MWCNT composite foams of 0 wt% (a), 0.01 wt% (b), 0.03 wt% (c), 0.05 wt% (d), 0.07 wt% (e), 0.1 wt% (f), 0.15 wt% (g), 0.2 wt%(h)

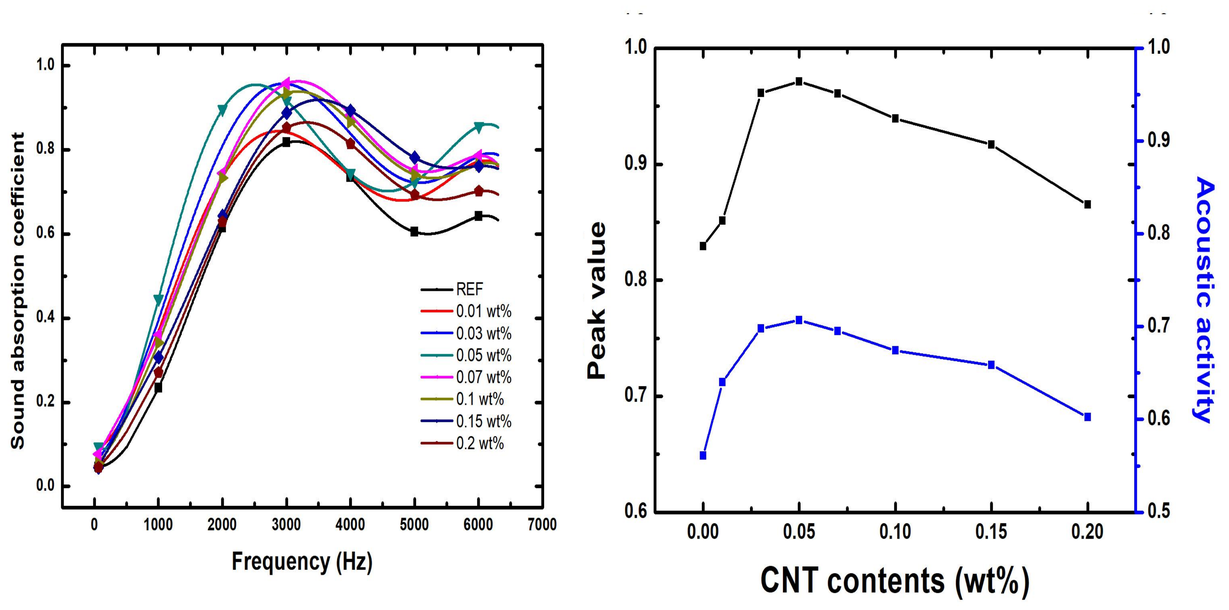

Figure 6. (a) Sound absorption coefficient of polyurethane composite foams including MWCNT for various content (b) Peak value of Sound absorption coefficient and Acoustic activity of polyurethane composite foams including MWCNT for various content

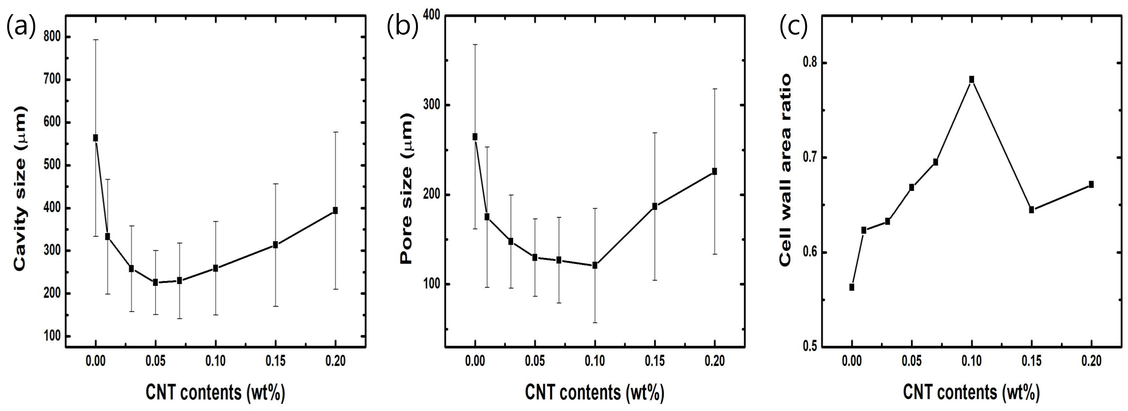

Figure 5. PU Foam morphology data as a function of MWCNT filler contents : (a) average cavity size (b) average pore size (c) cell wall ratio.

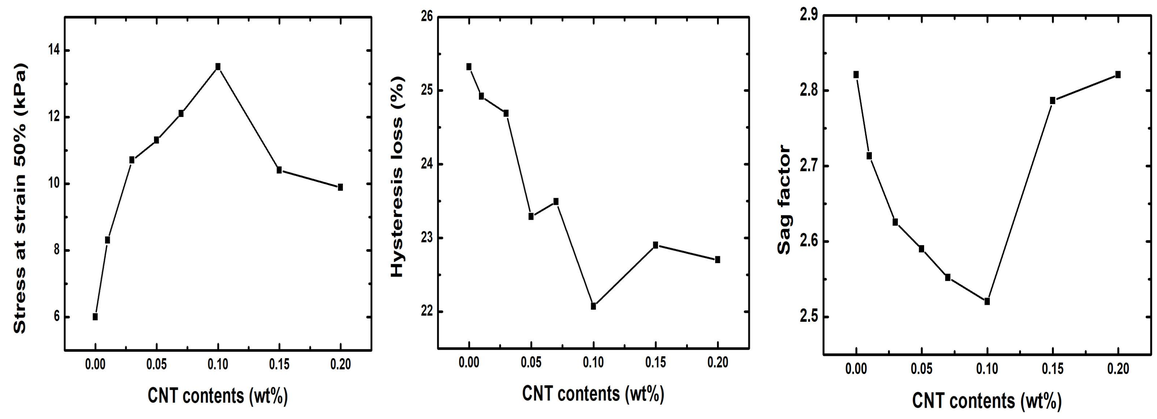

Figure 7. PU Foam physical property data as a function of MWCNT filler contents : (a) stress at strain 50 %, (b) hysteresis loss, (c) sag factor.

Reference

1) G. Sung, J.W. Kim, J.H. Kim, Fabrication of polyurethane composite foams with magnesium hydroxide filler for improved sound absorption, J. Ind. Eng. Chem. 44 (2016) 99-104

2) J.G. Gwon, S.K. Kim, J.H. Kim, Sound absorption behavior of flexible polyurethane foams with distinct cellular structures, Mater. Des. 89 (2016) 448-454.

3) Giwook Sung, Jung Hyeun Kim, Influence of filler surface characteristics on morphological, physical,
acoustic properties of polyurethane composite foams filled with inorganic fillers, Composites Science and Technology 146 (2017) 147e154

2020 Project Design **Nano System Applications Laboratory**