Supporting Information

Density-tunable lightweight polymer composites with dual-functional ability of efficient EMI shielding and heat dissipation

Seung Hwan Lee § [a,b], Seunggun Yu § [a,c], Faisal Shahzad[a,d], Woo Nyon Kim[a,b], Cheolmin Park[a,d], Soon Man Hong[a], and Chong Min Koo[a,d,e]*

[a] *Materials Architecturing Research Center, Korea Institute of Science and Technology, 5, Hwarang-ro 14-gil, Seongbuk-gu, Seoul 02792, Republic of Korea*

[b] *Department of Chemical and Biological Engineering, Korea University, Seoul, 136-713, Republic of Korea*

[c] *Department of Materials Science and Engineering, Yonsei University, Seoul, 120-749, Republic of Korea*

[d] *Nanomaterials Science and Engineering, University of Science and Technology, 217, Gajung-ro, Yuseong-gu, Daejeon 34113, Republic of Korea*

[e] *KU-KIST Graduate School of Science and Technology, Korea University, Anam-ro 145, Seongbuk-gu, Seoul 02841, Republic of Korea*

§ *These authors contributed equally*

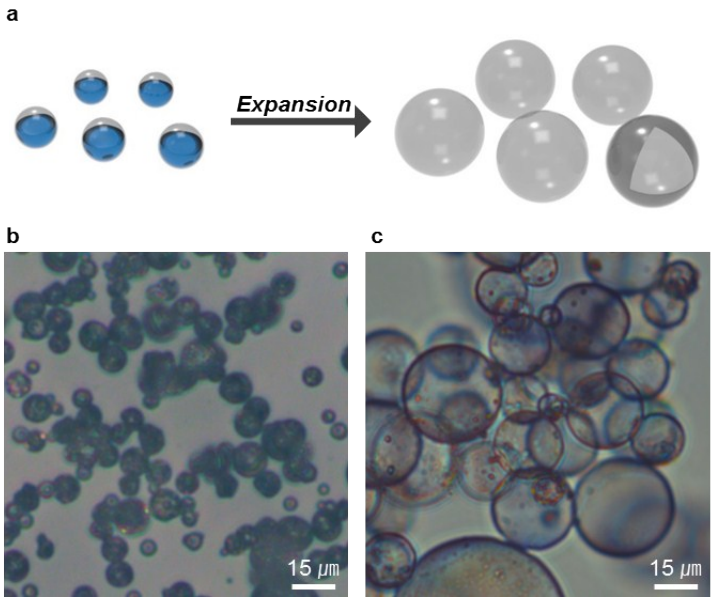

Fig. S1. a) Schematic illustration of expansion process of expandable polymer beads. Optical micrographs of polymer beads: b) before and c) after expansion.

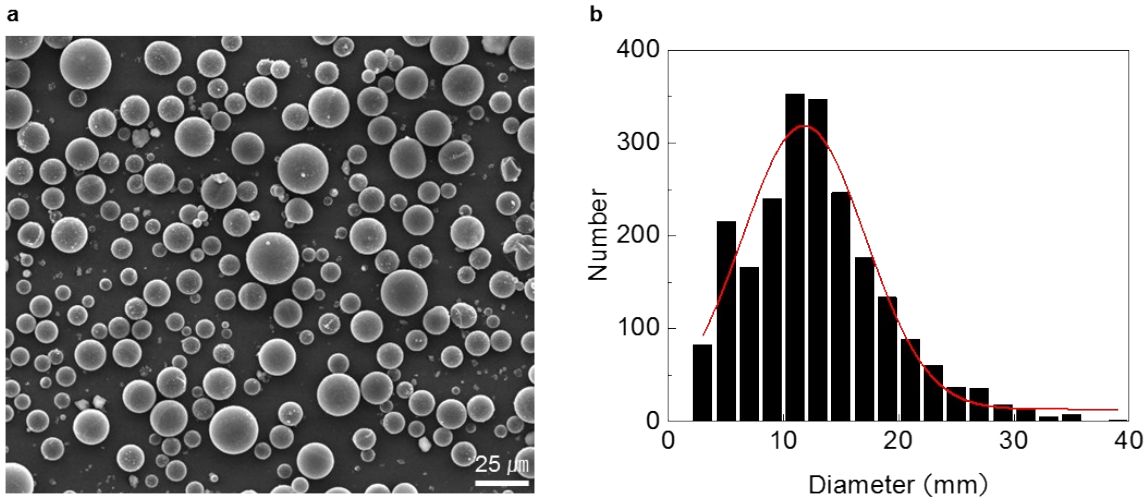

Fig. S2. a) SEM image and b) size distribution plots of expanded polymer beads.

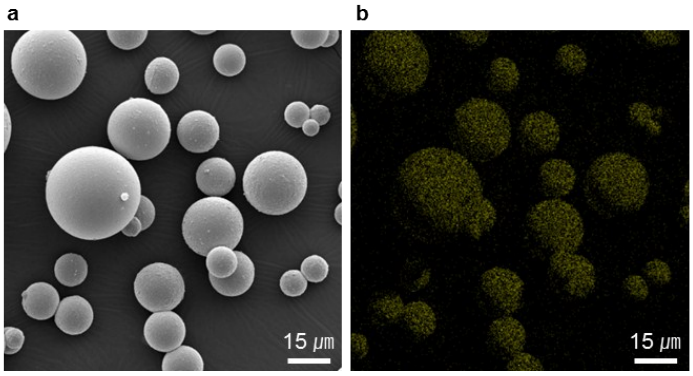

Fig. S3. a,b) SEM and EDS mapping images of EBCu beads. The existence of Cu was highlighted with yellow color.

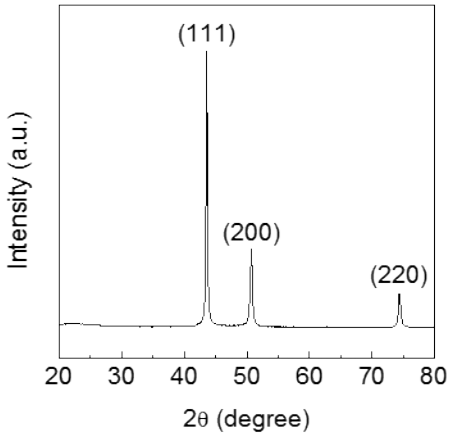

Fig. S4. XRD pattern of EBCu particles.

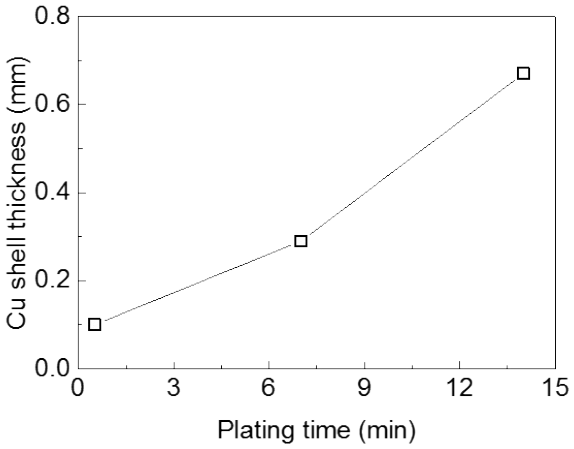

Fig. S5. Cu shell thickness plated on EBCu particles as a function of electroless plating time.

Fig. S6. Photograph of EB particles in water. The EB particles float on water due to their ultralow density (ρ ~ 0.02 g cm^{-3}).

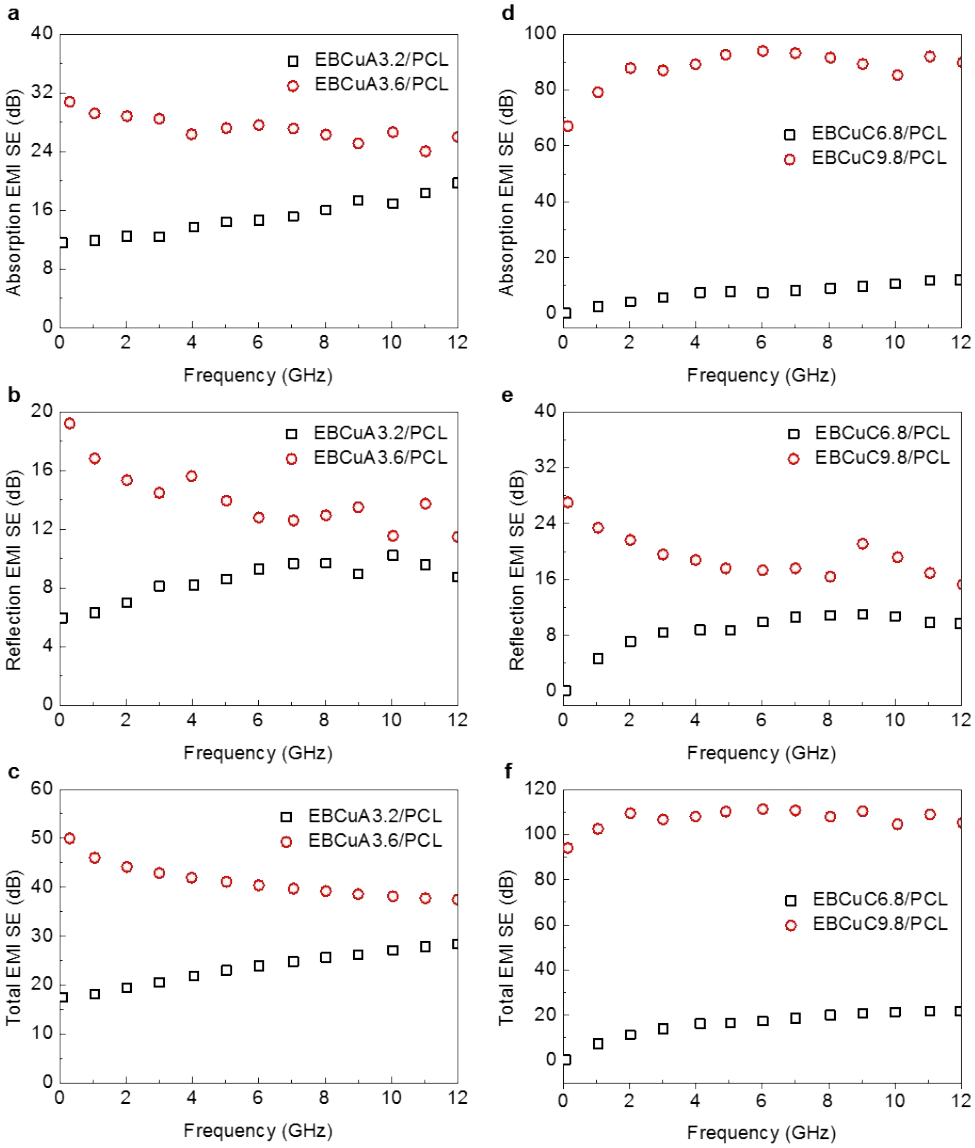

Fig. S7. Absorption, reflection, and total EMI SE values of: a,b,c) EBCuA/PCL and d,e,f) EBCuC/PCL composites, respectively, at various frequencies.

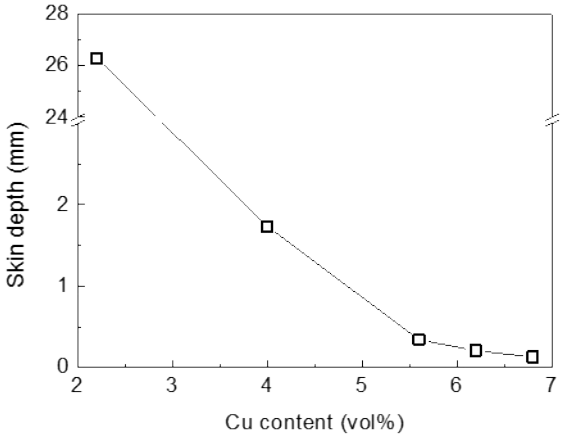

Fig. S8. Skin depth of EBCuB/PCL composite as a function of Cu content.

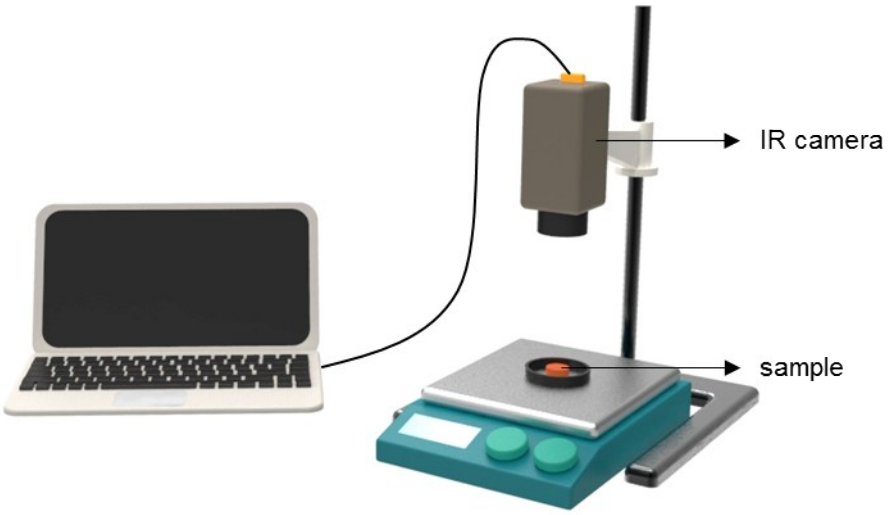

Fig. S9. Schematic illustration of measurement setup for thermal transport properties of samples upon heating using IR camera and hot plate apparatus.

Table S1. Shell thickness of EB and EBCu samples.

Sample	Shell thickness (μm)
EB	0.07 ~ 0.90
EBCuA	0.10 ± 0.01
EBCuB	0.29 ± 0.05
EBCuC	0.67 ± 0.10