Materials Horizons SUPPORTING INFORMATION

PLUS-Material: Porous Liquid-metal Enabled Ubiquitous Soft Material

Hongzhang Wang [#a], Bo Yuan [#a], Shuting Liang [a], Rui Guo [a], Wei Rao [b], Xuelin Wang [a], Hao Chang [b], Yujie Ding [b], Jing Liu * [a,b], Lei Wang * [b]

# These two authors contribute equally to this research.

a. Department of Biomedical Engineering, School of Medicine, Tsinghua University, Beijing 100084, China

E-mail: jliubme@tsinghua.edu.cn

b. Beijing Key Lab of Cryo-Biomedical Engineering and Key Lab of Cryogenics, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing 100190, China

E-mail: silu861004@163.com

Supporting information is included as follows:

Supporting Movie Legends

Supporting Figures

Supporting Movie Legends

Movie S1: Heating made the PLUS-M volume expanded quickly, and turned into the paste-like material and finally floated on the water

Movie S2: PLUS-M bulk was thrown into the bottom of beak with hot water (about 80^{o}C) and expands to float on the surface quickly.

Movie S3: After NaOH treatment for 24h and drying, PLUS-M became rigid state.

Movie S4: Comparison of PLUS-Material (left) and normal EGaIn (right) at 100 ^{o}C. PLUS-Material expanded to several times of its original volume while EGaIn showed almost no change.

Movie S5: During the expansion process, the sphere of PLUS-Material transferred from the liquid smooth surface to the rough porous structure due to the light irradiation.

Movie S6: The expansion of PLUS-Material in graduate cylinder driven by irradiation of laser light.

Movie S7: Expansion of PLUS-M (2.5g, rinsed by 2mol/L HCl) in the balloon drove the weight (20g) away from the bottom at 60 ^{o}C. The PLUS-M inside the balloon generates much hydrogen, which extends its volume and induces the transformation from liquid to solid foam.

Movie S8: The head of saucer made by PLUS-M was controlled up and down by the remote laser light.

Movie S9: The rotation of magnetic PLUS-Materials controlled by the magnetic stirrer. The rotor speed is 100r/min.

Supporting Figures

Figure S1

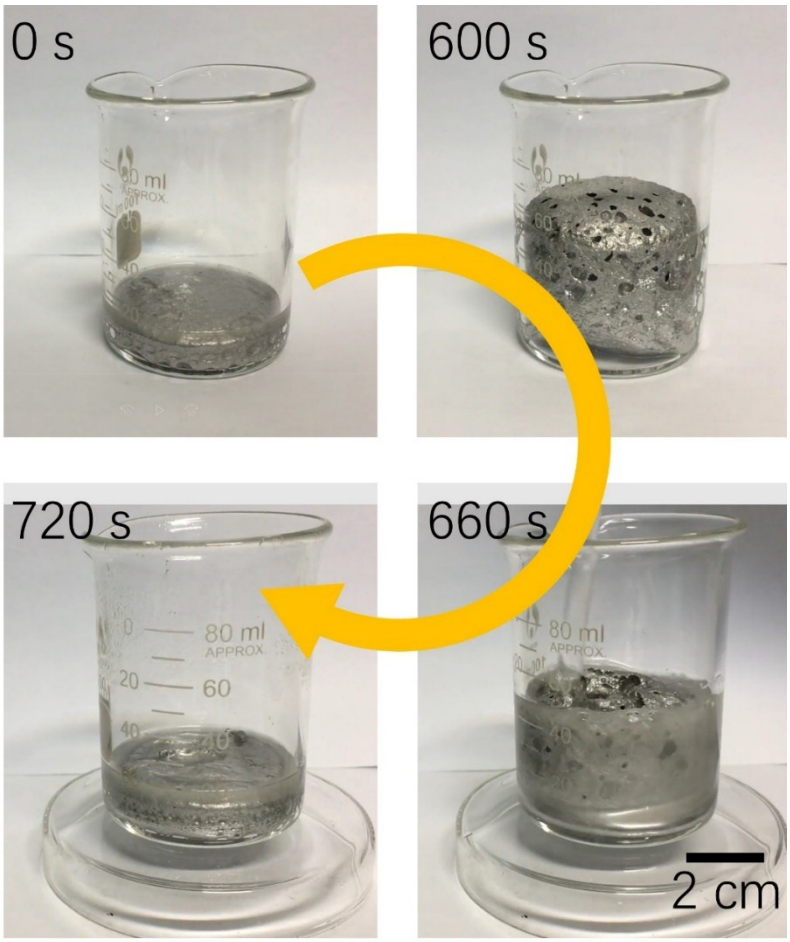

Figure S1. The recurrent expansion of PLUS-M. PLUS-M transferred from liquid into solid foam and expanded with the increasing temperature. It recovered into its initial liquid state with the decreasing temperature and stirring. This expansion and recovering would cycle multiple times. The scale bar is 2cm.

Figure S2

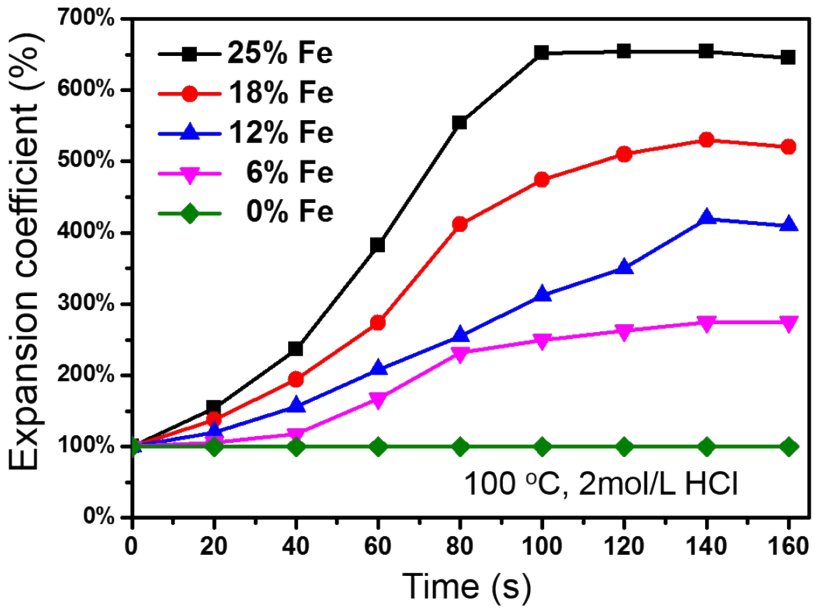

Figure S2. Expansion coefficient of PLUS-M with different Fe ratio. As the increase of Fe element, the expansion speed increases fast. When the mass ratio of Fe larger than 25%, it could not mix with liquid metal.

Figure S3

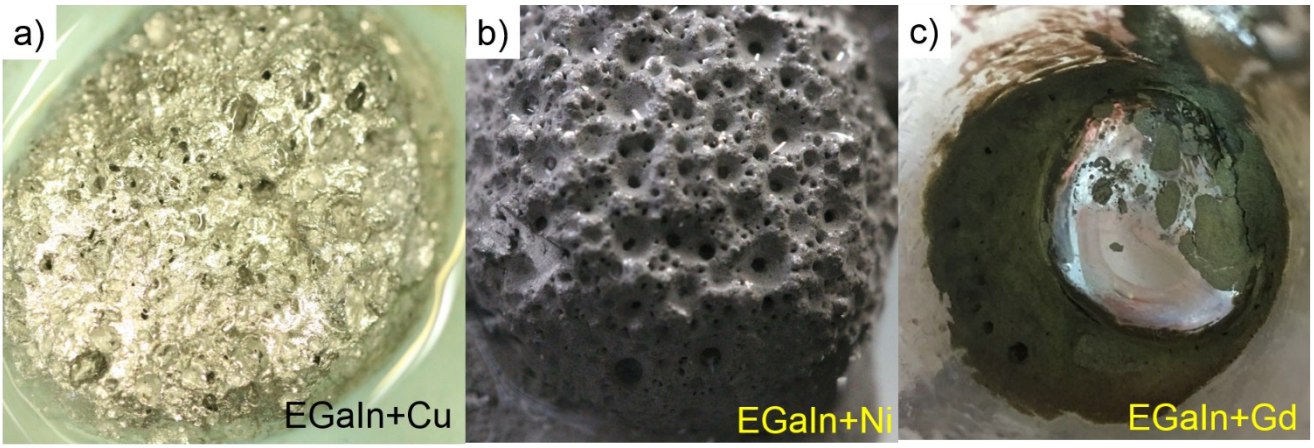

Figure S3. Three metal elements such as Cu (a), Ni (b) and Gd (c) were mixed with liquid metal (EGaIn). After heating at 100 ^{o}C, Cu and Ni based EGaIn showed poor expansion and porous topography (a, b). The gadolinium could not mix with EGaIn (c)
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Figure S4

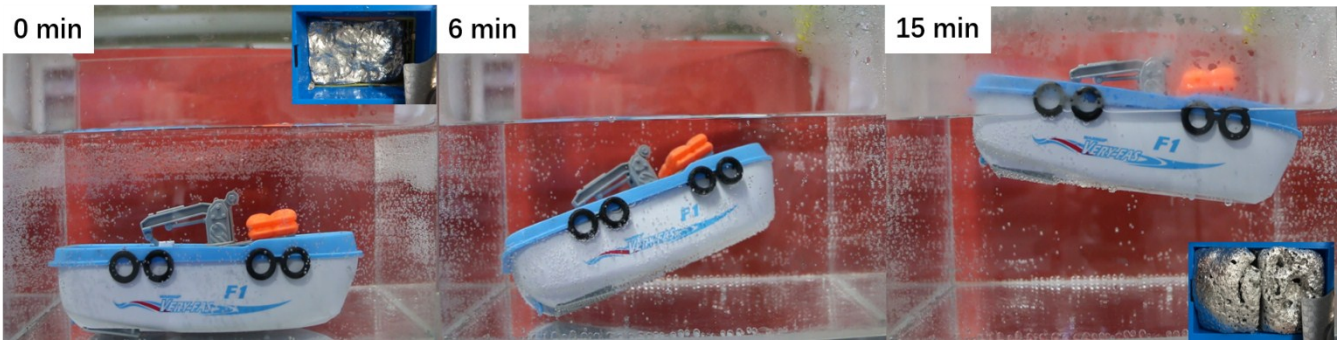

Figure S4. PLUS-M was used to left a device (ship) from bottom of the water. At 60 °C, the ship was delieved from the bottom to water surface.in 15 minutes and the PLUS-M in the cabin expanded meanwhile.