Huaying Ren[1,2]
Miao Tang[1], Baolu Guan[3], Hailin Peng[1], Zhongfan Liu[1,2]
1 Center for Nanochemistry, Beijing Science and Engineering Center for Nanocarbons, Beijing National Laboratory for Molecular Sciences, College of Chemistry and Molecular Engineering, Peking University, Beijing 100871, P. R. China
2 Academy for Advanced Interdisciplinary Studies, Peking University, Beijing, 100871, P. R. China
2 Key Laboratory of Opto-electronics Technology, Ministry of Education, College of Electronic Science and Technology, Faculty of Information Technology, Beijing University of Technology, Beijing 100022, P. R. China
renhy-cnc@pku.edu.cn

Hierarchical Graphene Foam for Efficient Solar-thermal Conversion

Efficient solar-thermal conversion is essential for the harvest and transformation of the abundant solar energy, leading to the exploration and design of efficient solar-thermal materials. Carbon-based materials especially graphene have the advantages of a broadband absorption, excellent photothermal properties, holding promise in solar-thermal energy conversion [1-4]. Herein, we report the synthesis of hierarchical graphene foam (h-G foam) with continuous porosity via plasma-enhanced chemical vapor deposition (PECVD). This h-G foam consists of vertical graphene nanoplates array on the 3D foam skeleton, which provides much larger heat exchange area. This unique structure dramatically enhance the omnidirectional absorption of sunlight, and thereby could enable a considerable elevation of the temperature. Used as heating material, the external solar-thermal conversion efficiency impressively reaches up to ~93.4% and the solar-vapor conversion efficiency exceeds 90% for seawater desalination with high endurance.

References

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Figures

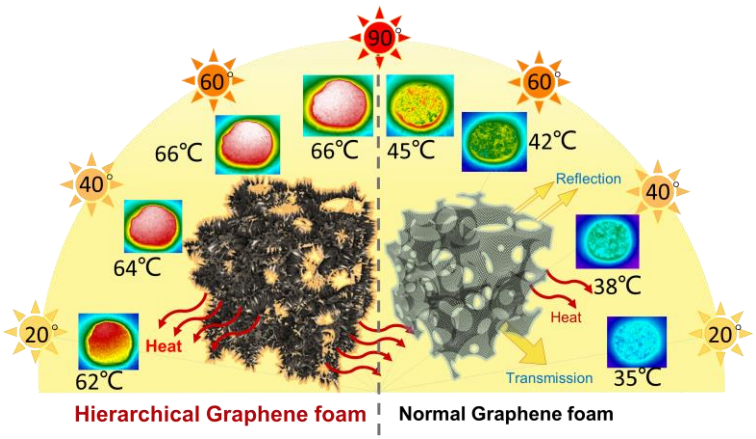

Figure 1: The schematic and IR image of solar-thermal conversion difference between h-G foam and normal G foam under various incident angles.