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Advanced Absorbents for Underwater Oil Removal and 3D Printing of Auxetic Strain Sensors using Deep Eutectic Solvents

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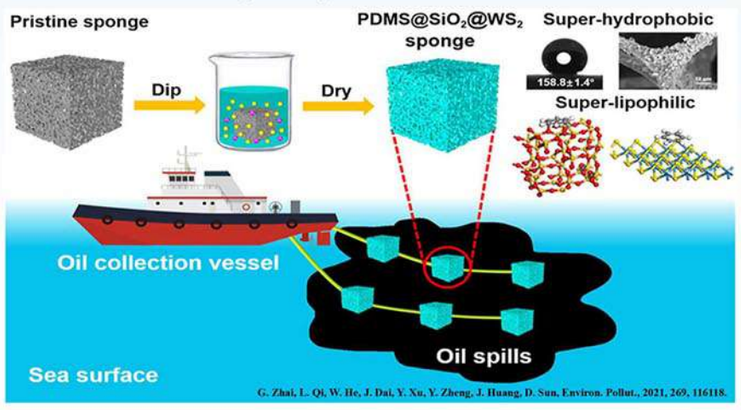
Amphibious Superamphiphilic Monoliths for Underwater Oil Removal Applications

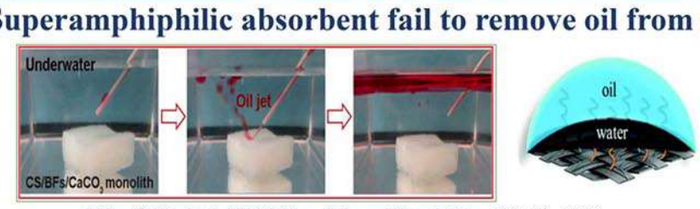
Most superamphiphilic absorbents cannot remove oil waste from water due to their hydrophobic feature in underwater environments. In this work, an amphibious superamphiphilic absorbent was fabricated using a simple and low-cost emulsion templating technique. The absorbent can remove various oil waste and organic solvents from water with high absorbing capacities and good recyclability and it can work even in harsh conditions.

Introduction

Absorbent for organic pollutants removal

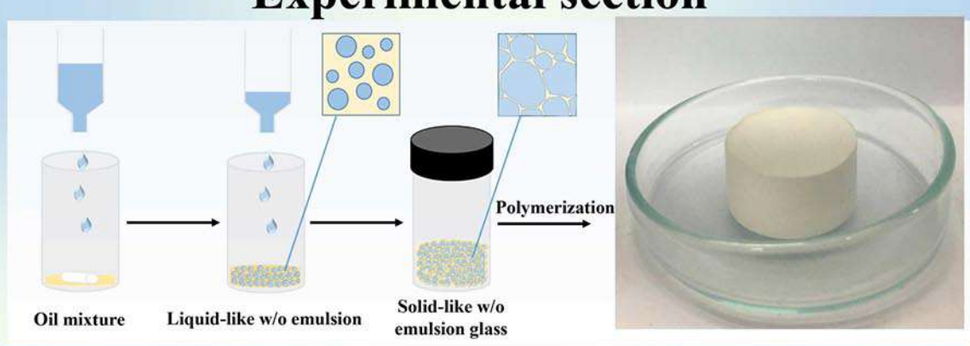


Superamphiphilic absorbent fail to remove oil from water

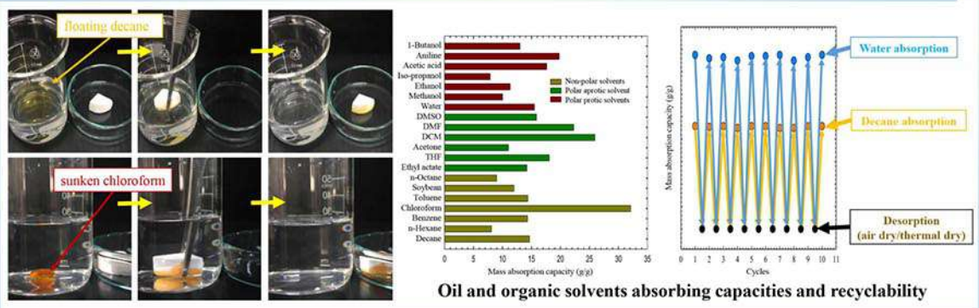


J. Yang, Q. Xiao, X. Jia, Y. Li, S. Wang, H. Song, *J. Hazard. Mater.*, 2021, 403, 124016.

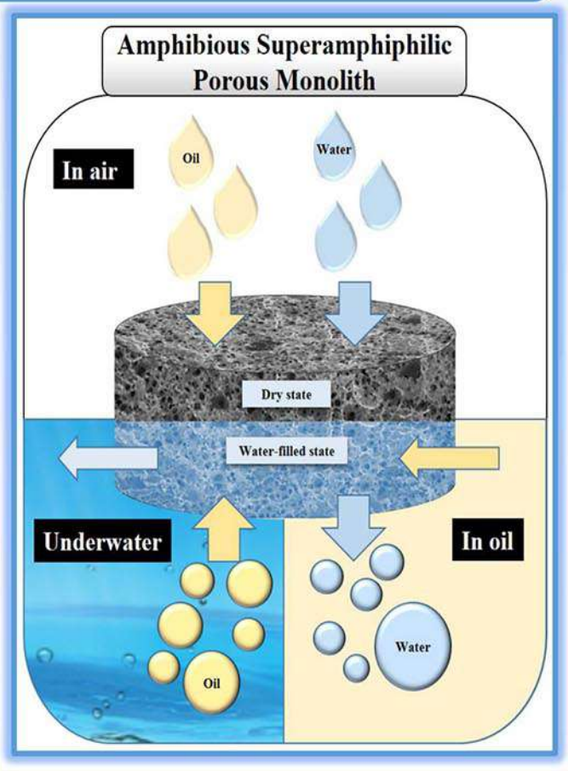
Experimental section



Results and Discussion



Oil and organic solvents absorbing capacities and recyclability

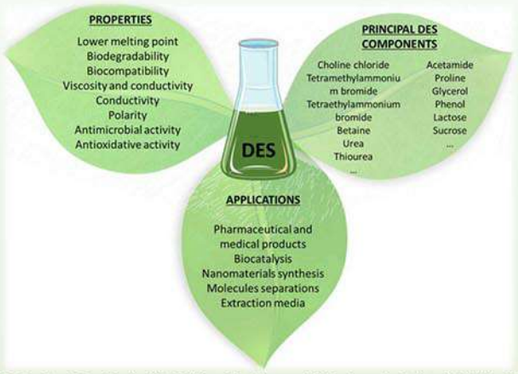


Jammed Microgels in Deep Eutectic Solvents as a Green and Low-Cost 3D Printing Ink

Deep eutectic solvents (DESs) have attracted attention due to their green, low-cost, biocompatible, and renewable features. However, the development of sustainable synthesis processes for 3D printing ink from DESs remains a major challenge. In this work, a simple two-step mixing approach is developed to prepare microgel-based 3D printing ink from DESs. The 3D-printed auxetic structure shows negative Poisson's ratios (within 100% strain), high stretchability (300%), high sensitivity (gauge factor of 3.1), good moisture resistance, and sufficient transparency. It can detect human motion with high skin comfort and breathability. The results of this work highlight a green, low-cost, and energy-saving strategy to fabricate the conductive microgel-based ink for 3D printing of wearable devices.

Introduction

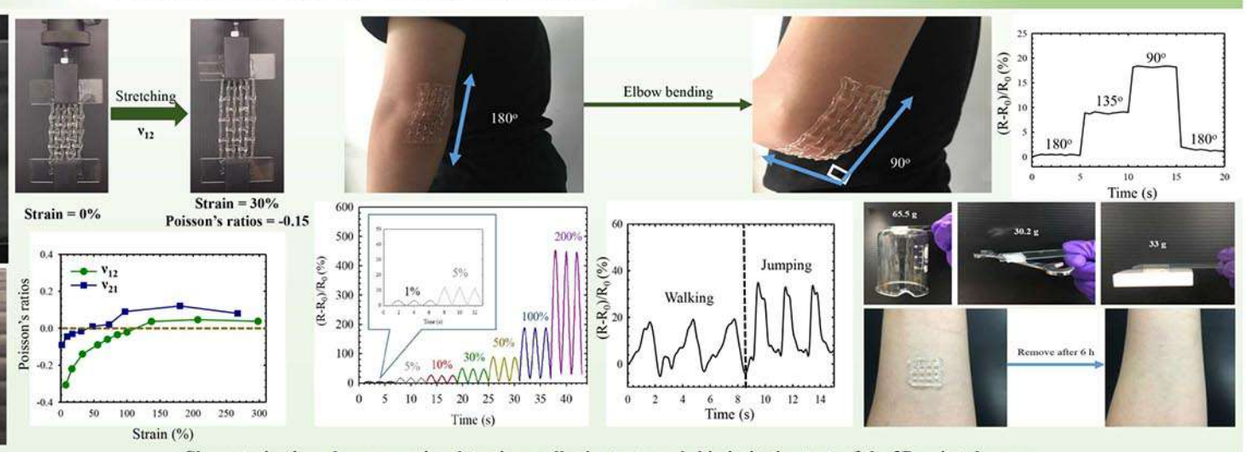
Deep eutectic solvents as promising green solvents



L. Lomba, C. B. García, M. P. Ribate, B. Giner and E. Zuriaga, *Appl. Sci.*, 2021, 11, 10156.

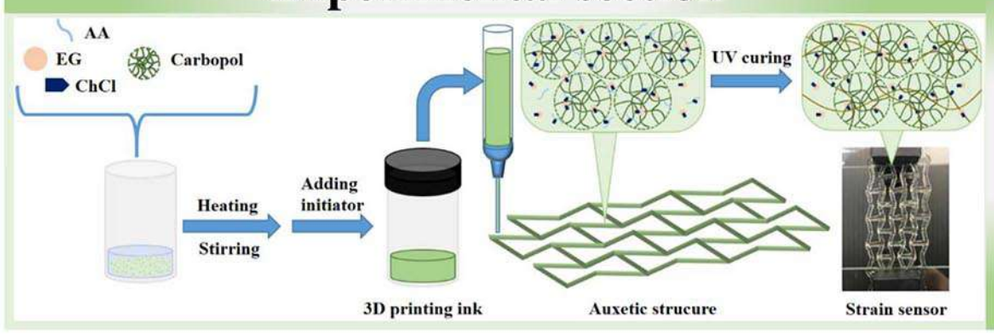
Results and Discussion

Eutectogel with various structures



Characterizations, human motion detections, adhesive tests, and skin irritation tests of the 3D-printed sensor

Experimental section



Conclusions

- **Amphibious superamphiphilic monolith**
  - ❑ The amphibious superamphiphilic monolith is prepared by a simple emulsion templating method and it can be used as an advanced absorbent for underwater oil removal.
  - ❑ This work provides a facile approach to fabricating porous materials with amphibious superamphiphilicity for various applications such as biphasic catalysts and oil-selective adsorbents.
- **Jammed Microgels in Deep Eutectic Solvents as a Green and Low-Cost 3D Printing**
  - ❑ The first green, low-cost, and biocompatible microgel-in-DES ink is prepared by a simple method.
  - ❑ The auxetic sensor exhibits a negative Poisson's ratio that can enhance skin comfort and breathability and it can be used as a strain sensor to detect human motions.
  - ❑ This work highlights a facile approach to fabricating microgel-based ink for the 3D printing of wearable electronics.

References

[1] T.H. Vo, P.K. Lam, Y.-J. Sheng, H.-K. Tsao, Amphibious superamphiphilic polystyrene monolith with underwater superoleophilicity: Capture of underwater oil, *Appl. Surf. Sci.* 570 (2021) 151142.
[2] T.H. Vo, P.K. Lam, Y.-J. Sheng, H.-K.Tsao, Jammed Microgels in Deep Eutectic Solvents as a Geen and Low-Cost Ink for 3d Printing of Reliable Auxetic Strain Sensor. Available at SSRN 4249712.