Researchers develop tillandsia-inspired hygroscopic photothermal organogels for atmospheric water harvesting

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As a typical representative of air plants, Tillandsia species can absorb moisture from the air with their leaves. Inspired by this hygroscopic

foliage, Prof. Chen Tao's team at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of Sciences (CAS), has developed a new type of hygroscopic photothermal organogel (POG).

The resulted POG can capture atmospheric moisture and realize in situ solar-driven interfacial water release. The findings were published in *Angewandte Chemie International Edition*.

The researchers at NIMTE found that the well-designed hydrophilic co-polymeric network keeps the hygroscopic glycerin medium in the solid form, which can solve the problems caused by the flowable characteristics of the liquid sorbents. On the other hand, the combination of hydrophilic co-polymeric network and hygroscopic glycerin medium plays a synergistic role in the moisture sorption. As a result, the POG performs efficient and continuous moisture sorption with the capacity of an equilibrium moisture sorption of 16.01 kg m^{-2} at a relative humidity (RH) of 90%.

Furthermore, the addition of interpenetrating photothermal polypyrrole-dopamine endows the POG with an excellent photothermal performance, which can achieve controllable solar-driven interfacial water release to obtain drinkable freshwater. In an outdoor experiment, the freshwater output of 2.43 kg m^{-2} day-1 could be achieved based on the POG, and the quality of the harvested water can fully meet the drinking water standards of the World Health Organization (WHO) and the United States Environmental Protection Agency (EPA).

Notably, this study has demonstrated a new material system of organogel for atmospheric water harvesting (AWH), which may highlight a route for the design of subsequent photothermal hygroscopic materials.

More information: Feng Ni et al. Tillandsia-inspired Hygroscopic

Photothermal Organogels for Efficient Atmospheric Water Harvesting, *Angewandte Chemie International Edition* (2020). DOI: 10.1002/anie.202007885