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Nanoengineered organic π-conjugated donor-acceptor-donor trimers particles for photocatalytic H_2 evolution

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Green H_2 is a promising solar fuel, offering near-zero carbon emissions (combustion results in water) while relying on renewable energy and using water as the primary reactant. The solar-to-hydrogen conversion typically involves two steps: **solar energy harvesting** via photovoltaic cells and subsequent **water electrolysis**. Alternatively, green H_2 production via photocatalytic water splitting integrates **both steps into a one-pot process**. This work presents a versatile platform for preparing functional nanoparticles using a soap-free (absence of surfactants) miniemulsification/solvent evaporation method. Donor-acceptor trimers (active material) are initially dissolved in a non-polar solvent (e.g. chloroform), generating the organic phase. Concurrently, aqueous phase containing the amphiphilic block copolymer synthesized by Reversible addition−fragmentation chain-transfer (RAFT) is prepared. Both phases are then mixed and subject ultrasonification generating the sub-micron size droplets, stabilized by hydrophilic segment. After solvent evaporation, the resulting particles show high photocatalytic activity (>500 µmol H_2 g^{-1} h^{-1}). Such results will pave the way for the next generation of photocatalytic generation of H_2 using highly-efficient, green, and safe chemical processes.

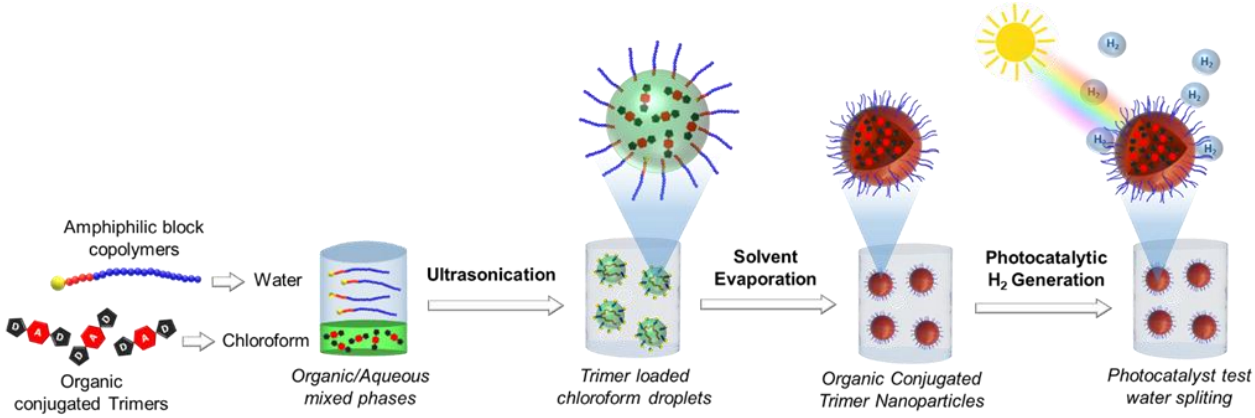

Figure 1. Nanoparticles stabilized by amphiphilic block copolymers for the photocatalytic H_2 production.

1. T. R. Guimaraes, A. Khan, H. Remita, J. L. Bobet and E. Cloutet. Organic Donor-Acceptor-Donor Trimers Nanoparticles Stabilized by Amphiphilic Block Copolymers for Photocatalytic Generation of H_2. *Macromol Rapid Commun*, 2024, **45**, e2400395.