

Optically switched transient amyloid-like fibrils for antibiotic degradation

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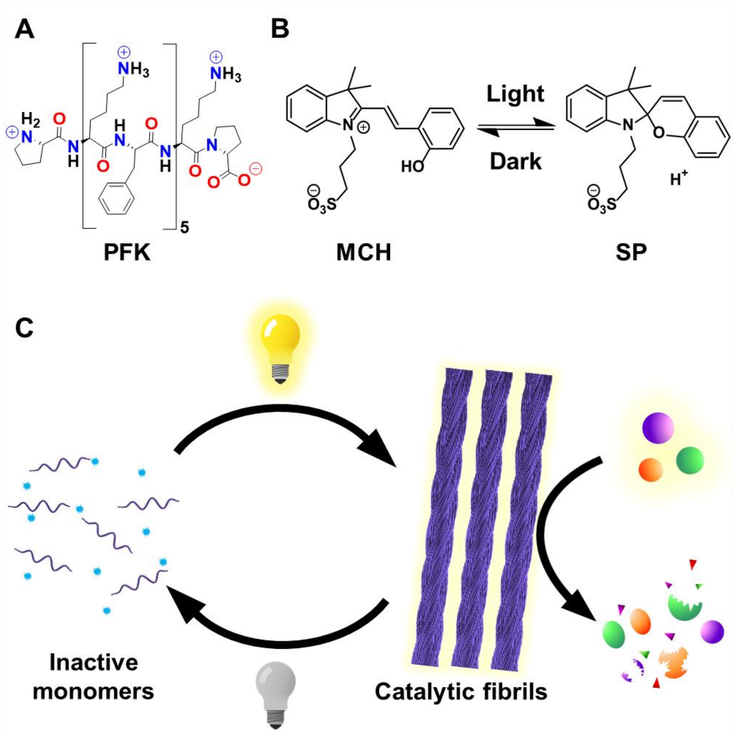
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Abstract

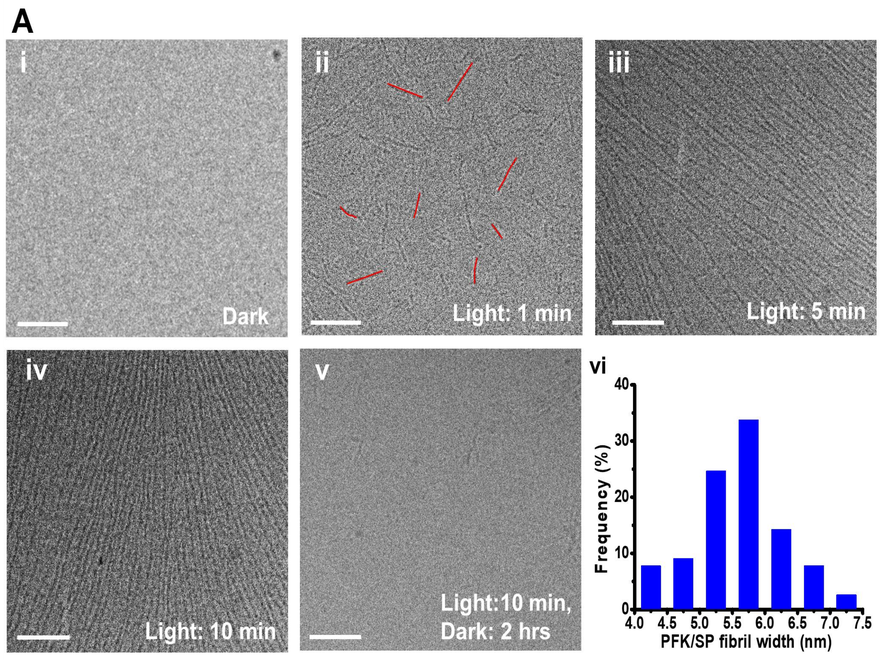
Light-mediated, nematic liquid-crystalline ordered amyloid-like fibrils form in water from a short peptide, PFK, and the photoacid **MCH**. The fibrils with an **anti-parallel ß-sheet structure** are formed **exclusively under light** due to the transformation of **MCH** to **SP, which** interacts with PFK to form fibrils. Such light-mediated fibrils are highly **catalytic towards ß-lactam ring opening** of common antibiotics, offering a platform for light-mediated degradation of antibiotic pollutants in water, a major health and environmental hazard.

Overview

- Optically-switched **nematic liquid-crystal-like** arrangement of fibrils
- Photo-switchable **anti-parallel ß-sheet** like transient amyloid assembly
- Efficient catalytic activity towards **hydrolysis of ß-lactam antibiotics**

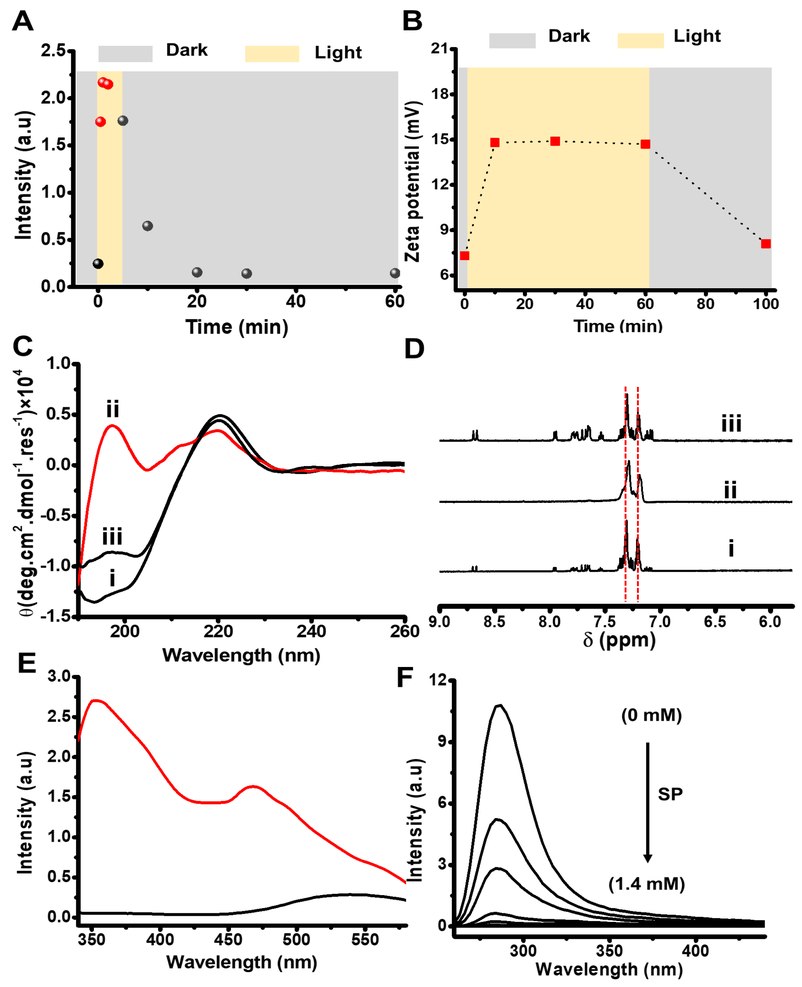


Microscopic analyses



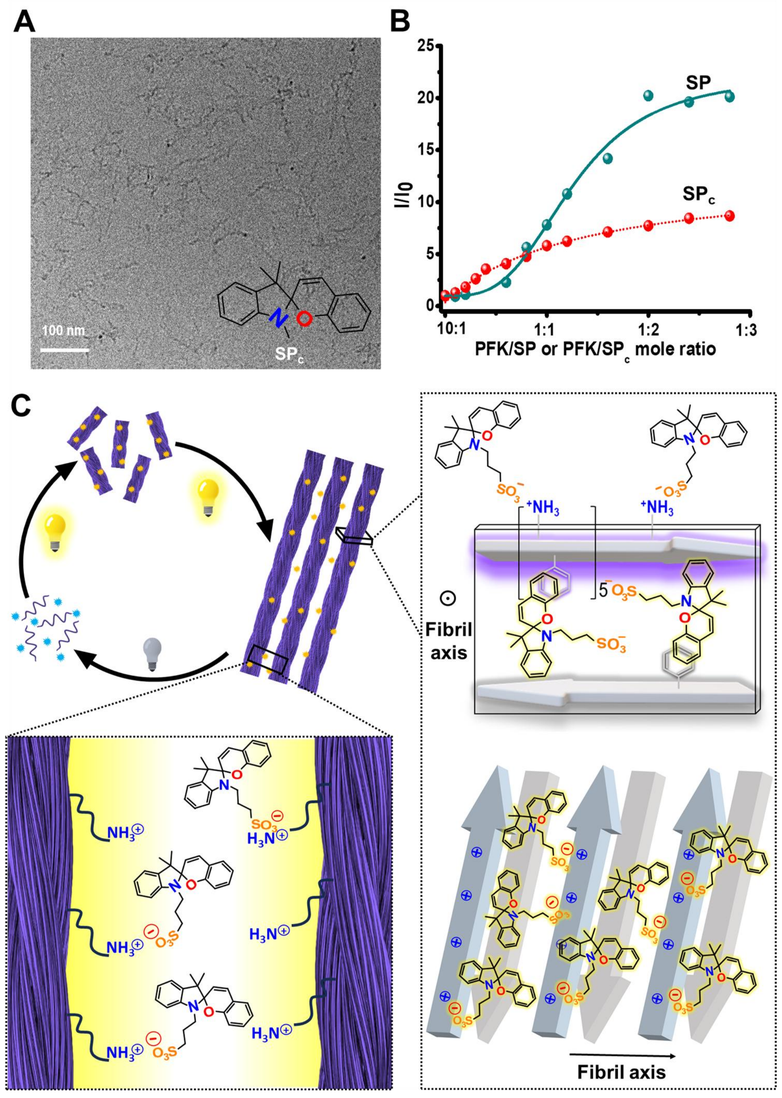
- Light-mediated reversible and highly **ordered** fibril formation
- Time- and **MCH-concentration-dependent** fibrillation

Spectroscopic analyses



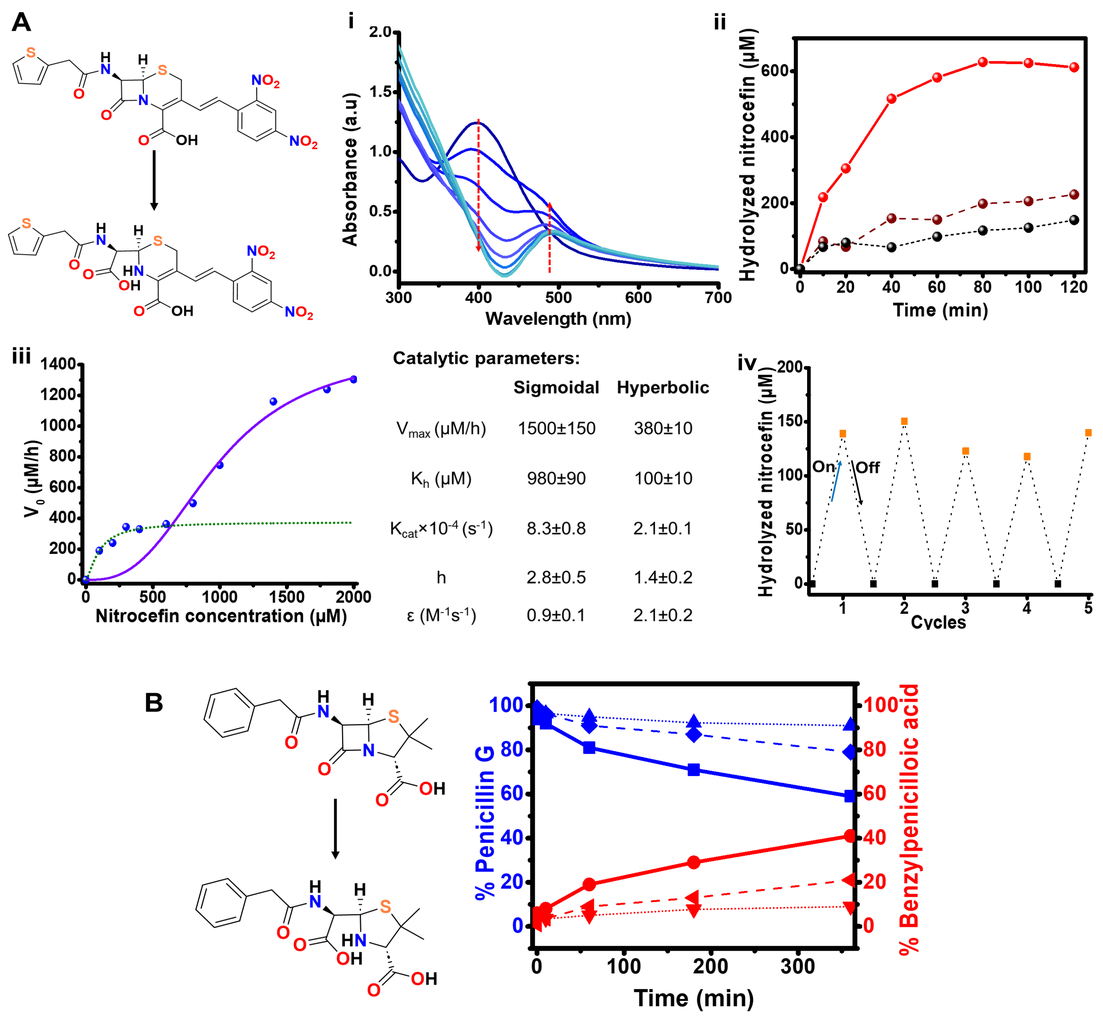
- Amyloids with anti-parallel ß-sheet structure with positively charged surfaces
- **Polar MCH to non-polar SP transformation** is responsible for such fibrillation under light

Structural Insight



- **SP_c** also induced **fibrillation of PFK**
- SP-induced fibrillation follows a sigmoidal isotherm
- **π-π interactions** drive **PFK fibrillation**, whereas **electrostatic interactions** govern the fibril arrangement

Hydrolysis of Antibiotics



- Enzyme-like **ß-lactam ring hydrolysis** of **nitrocefin** and **penicillin G** by light-mediated **catalytic amyloids**

Conclusion

- Light-induced **reversible amyloid** formation
- Photoinduced **long-range amyloid assembly** (fibril alignment)
- Photo-regulated **amyloid functionality** (catalysis)

Bibliography

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