Controlling Molecular Delivery
by Squeezing Liquid Crystal Dispersions with Light

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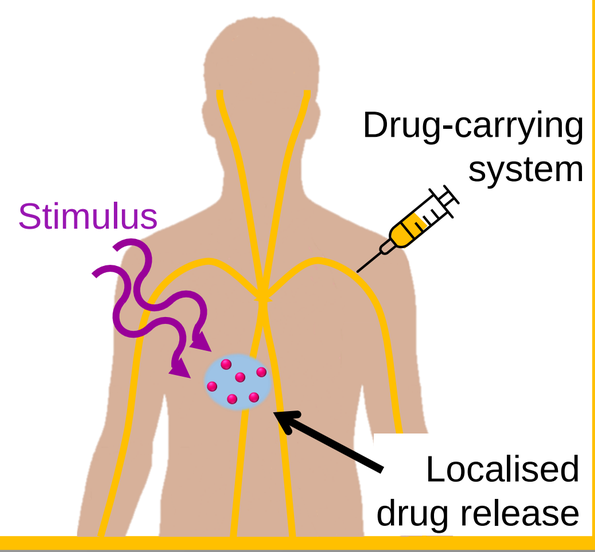
1 Why control molecular delivery?

Targeting the delivery of molecules, such as drugs allows:

- Better **performance**
- Lower **waste**
- Reduced **side-effects**[1]

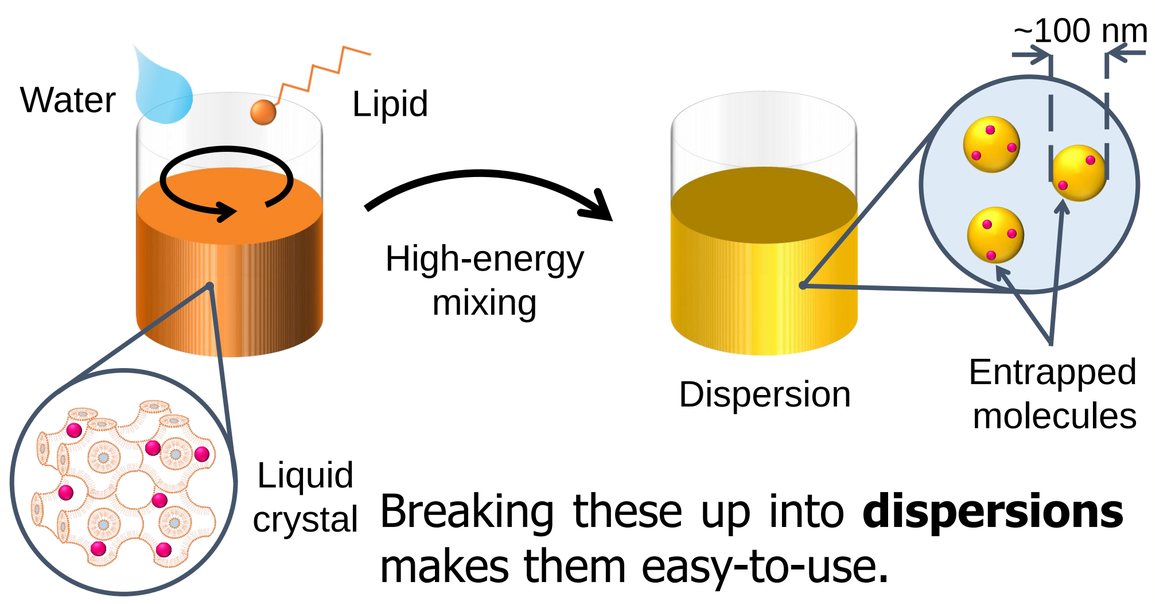
which is vital for toxic cancer treatments.

This requires systems that entrap molecules and release them on-demand.



2 How do we entrap molecules?

Liquid crystals have ordered structures that entrap molecules.



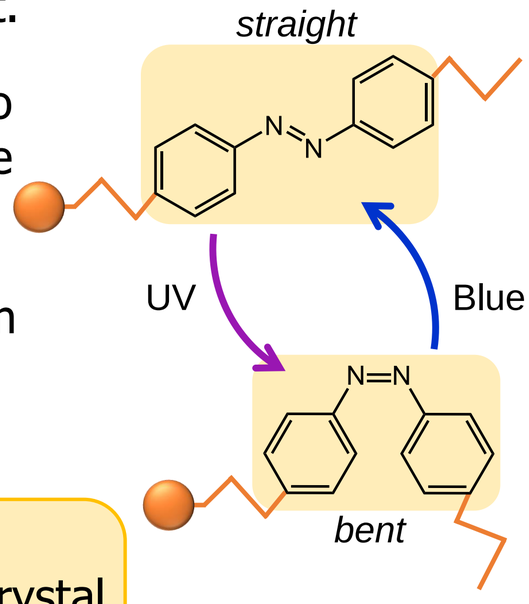
Breaking these up into **dispersions** makes them easy-to-use.

3 Adding a stimulus response

Azobenzene is a chemical group that changes shape on irradiation with light.

We can introduce it into molecules called azobenzene surfactants (**AzoPS**).[2]

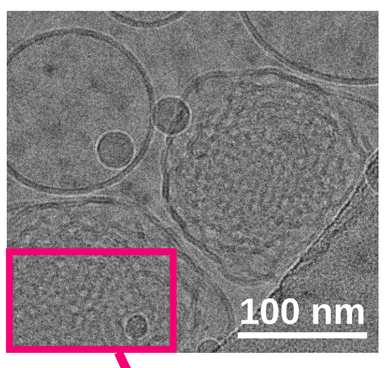
These **change shape** within seconds of UV irradiation.

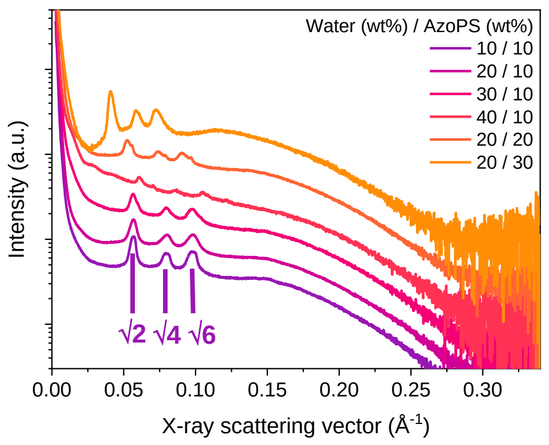


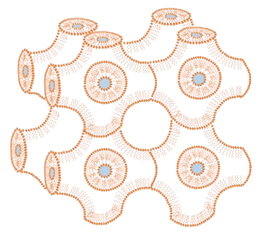
Question:
Can we use AzoPS in liquid crystal dispersions to release molecules in response to light?

4 Creating dispersions

Liquid crystals are formed by combining AzoPS with a lipid and water. These are broken up to form a dispersion of particles.







The particles have an **ordered cubic interior**, suitable to entrap molecules.

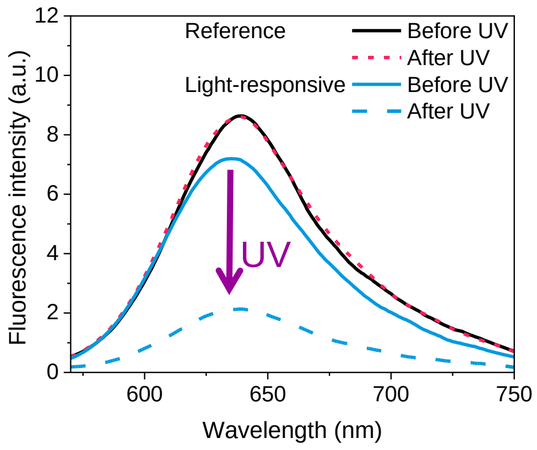
We can **change** the **size** of the cubic **structure** by changing the composition.

This enables future design to entrap different molecules.

5 Triggering release

A dye molecule was used to test **controlled delivery** using this system.

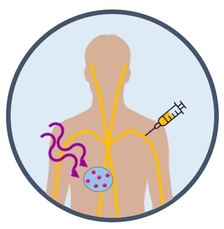
UV irradiation → AzoPS switch → lattice squeeze → dye release → decrease in fluorescence



Triggered release occurs within minutes.

6 Conclusions & outlook

We created a controlled delivery system which could be used for:


Drug delivery


Agriculture


Chemical industry

Future work is needed to optimise release for different molecules and using different light conditions.

1. *ACS Nano*, 2021, **15**, 16982.
2. *J. Mater. Chem. C*, 2019, **7**, 10945.

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