

Synthesis of Covalent Organic Frameworks (COFs) for the purpose of encapsulating and releasing glaucoma drugs

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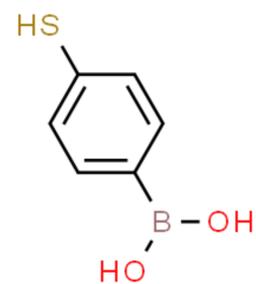
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ABSTRACT

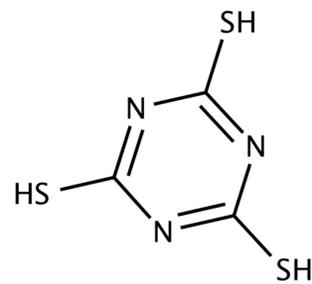
Drug delivery methods can be demanding on the patient and require them to administer drugs on their own. This is demanding and tedious on the individual. Covalent Organic Frameworks (COFs) are being experimented with as another alternative to drug delivery. With these COFs, the goal is to create a novel drug delivery mechanism that will absorb and release drugs at a targeted site. The goal is to create a COF that will encapsulate and release the drug – specifically a glaucoma drug - in a controlled manner over a prolonged period of time.

BACKGROUND

- COFs are light weight elements – usually composed of Boron, Carbon, Nitrogen, Oxygen, and Silicon [1]
- Drug delivery systems rely on self-administration
- Glaucoma patients have to take eye drops at least 2-3 times a day, and only take about 70% of their required eye drops
- COFs used in gas storage, drug delivery, optoelectronics, energy and biomedical applications [1]



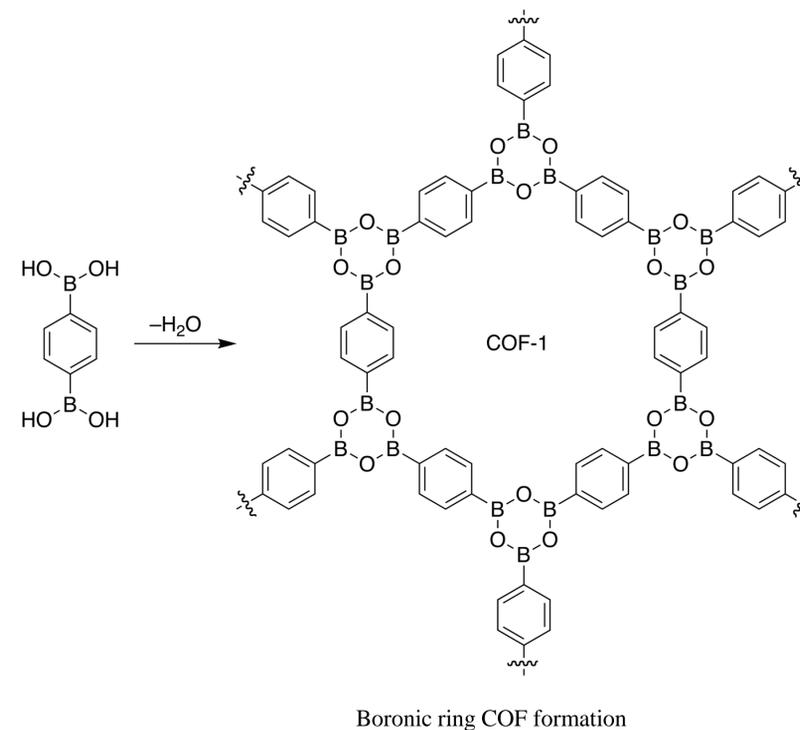
4-mercaptophenylboronic acid



Trithiocyanuric acid

MOTIVATION

- Develop a COF to encapsulate and release glaucoma drugs
- Implement this COF for *in vitro* testing and apply to bovine eye cadavers
- Further understand and enhance the knowledge of drug delivery mechanisms and application of COFs in drug delivery
- *Societal Impact:* contact lens to absorb the COF with the encapsulated glaucoma drugs and to release the drugs throughout the day to limit the burden on the individual applying eye drops multiple times a day



Boronic ring COF formation

APPROACH

Goal: Form a COF to encapsulate and release glaucoma drugs

Method: Form a COF via a chemical reaction between 4-mercaptophenylboronic acid with trithiocyanuric acid to encapsulate and release the glaucoma drugs. NMR will be used to confirm COF structure and formation of boronic ring

NEXT STEPS

- Continue testing COFs and their formation into the fall semester
- Focus on the encapsulation and release control mechanisms of COFs
- Implement and do testing on bovine eye cadavers in order to test and apply the encapsulation and release of the glaucoma drugs as contact lens in the eye

REFERENCES

- [1] Wu, M. and Yang, Y. Applications of covalent organic frameworks (COFs): From gas storage and separation to drug delivery. *Chinese Chemical Letters* **28**, 1135-1143 (2017)
- [2] Johns Hopkins University. How to succeed at eye drop treatment: It's all in your hands. *Hopkins Medicine*.