

Detecting nitrite in water using a dye-encapsulated Metal Organic Framework paper-based device

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1. Importance of detecting nutrients in coastal waters.

- Measuring the concentration of nutrients in coastal waters is essential for safeguarding against harmful algal blooms.
- However, transporting a water sample to a laboratory is limited by cost and availability of transport.¹
- Microfluidic paper-based analytical devices (μ PADs) provide accurate and sensitive data, are simple to fabricate and are made of inexpensive materials compared to other in-situ sensors.¹
- Metal organic frameworks (MOFs) will be used as the detection material, as they can be rationally designed to target specific molecules such as nitrite (NO_2^-).

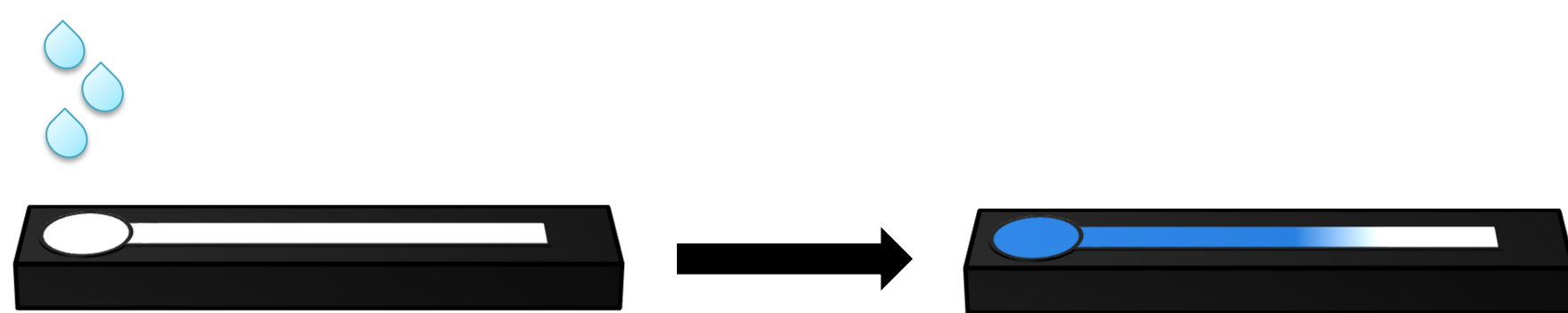


Figure 1: A schematic of a μ PAD, producing a response to a microvolume of water.

2. Rh6G@UiO-66-NH₂ as a sensor for nitrite.

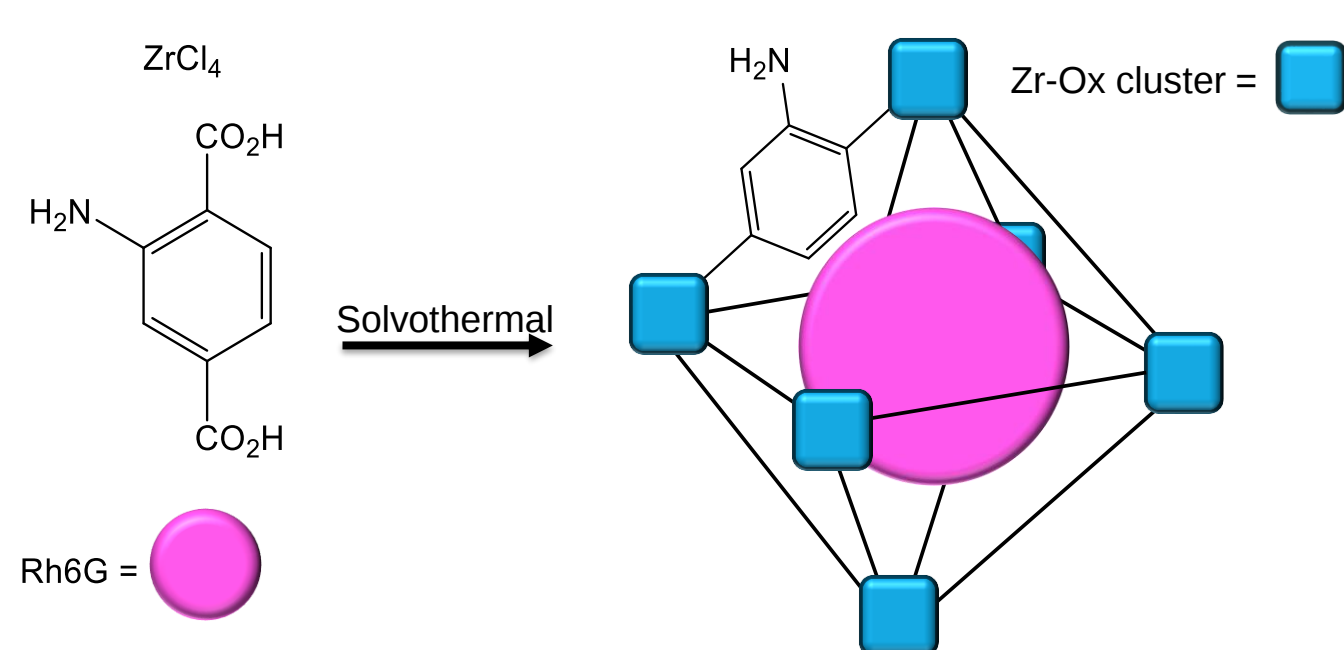


Figure 2: A schematic of the synthesis and structure of Rh6G@UiO-66-NH₂.

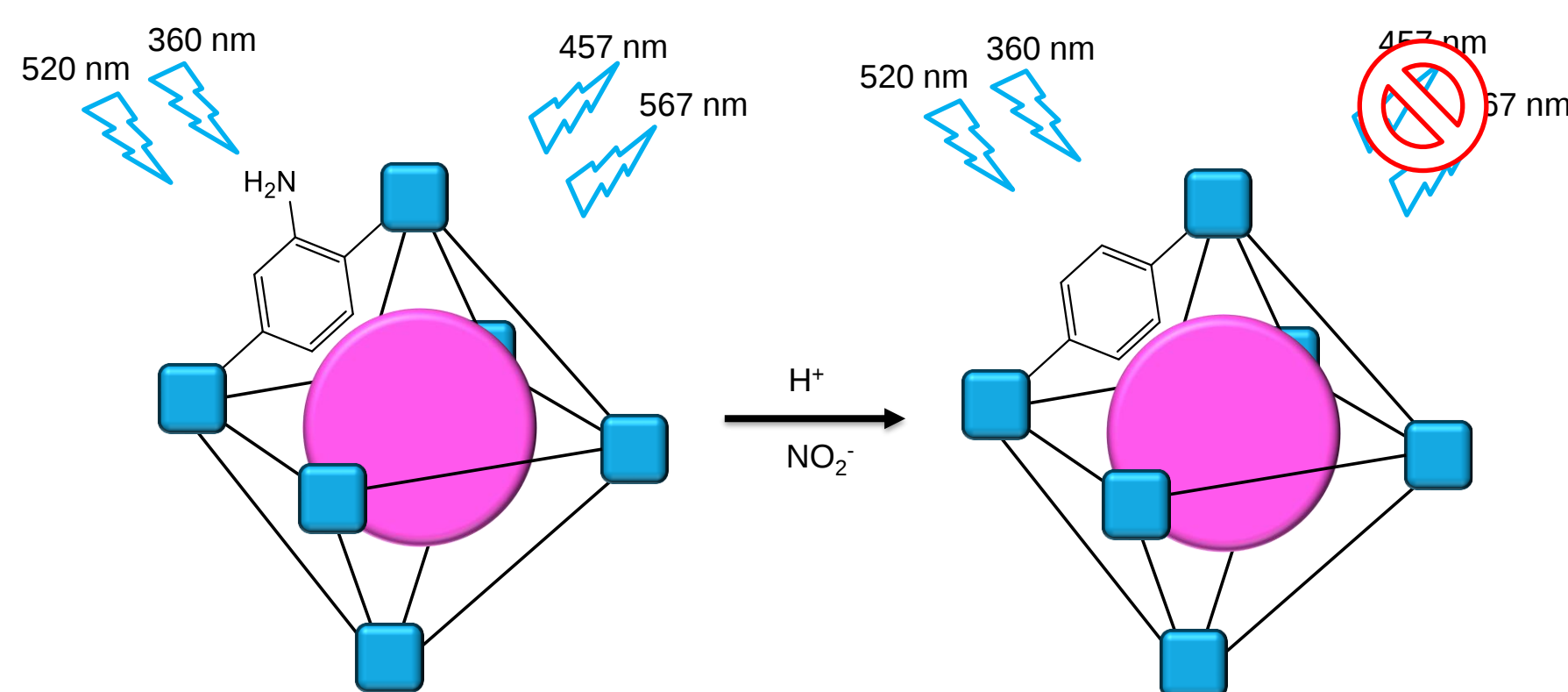


Figure 3: A schematic of the sensing mechanism of Rh6G@UiO-66-NH₂ towards NO_2^- .

3. Rh6G@UiO-66-NH₂ in solution responds to changing NO_2^- concentration but is affected by some interference ions.

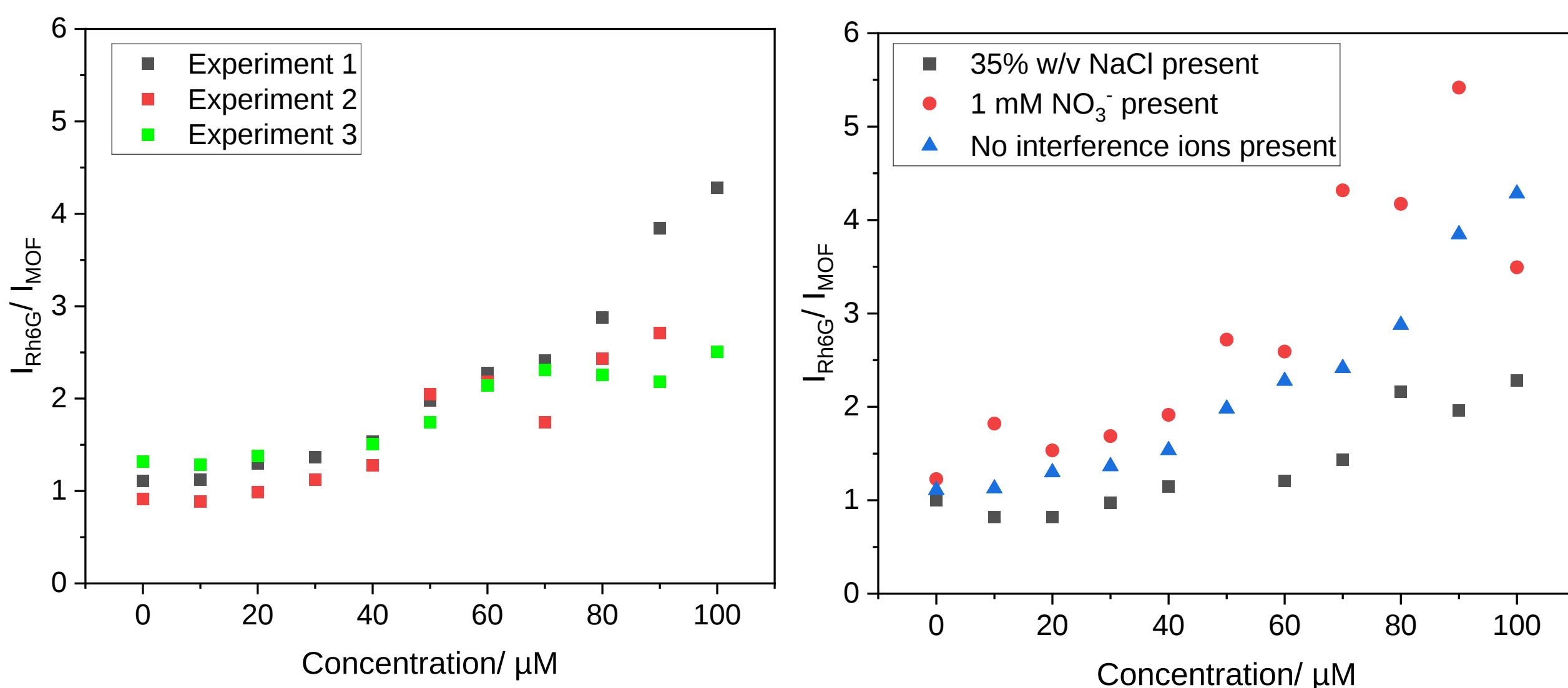


Figure 4: Fluorescence intensity ratio of Rh6G@UiO-66-NH₂ with changing NO_2^- concentration (left) and with interference ions present (right).

4. Grafting Rh6G@UiO-66-NH₂ onto functionalised filter paper.

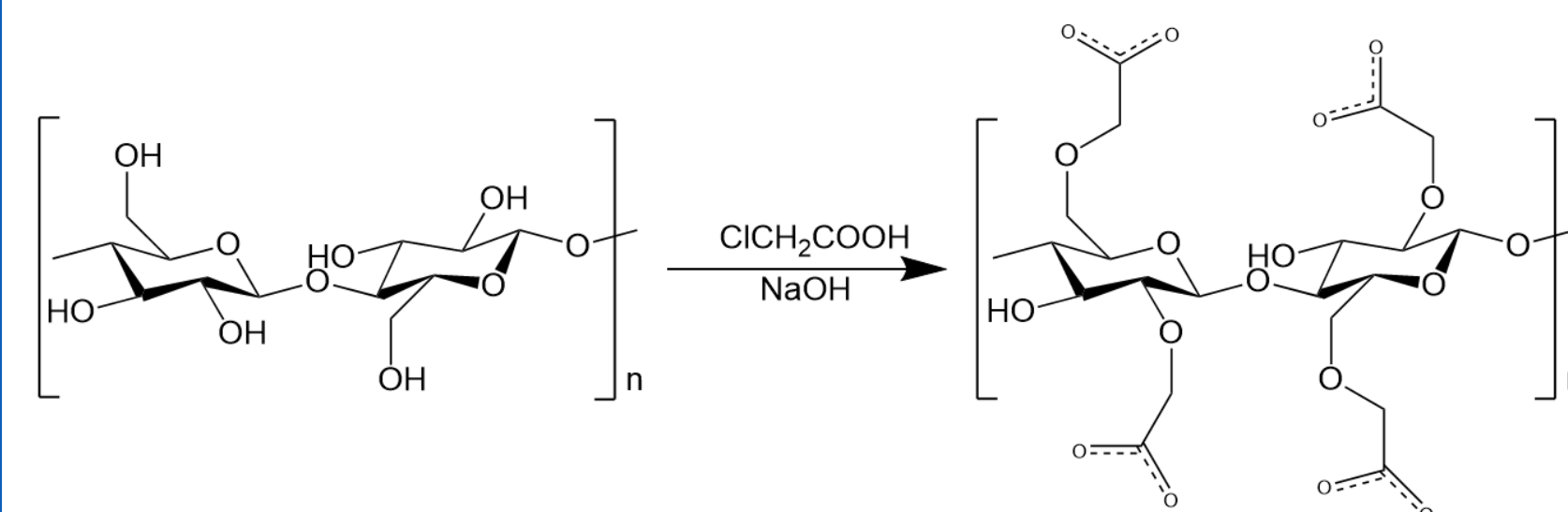


Figure 5: Surface functionalisation of FP to promote MOF growth.

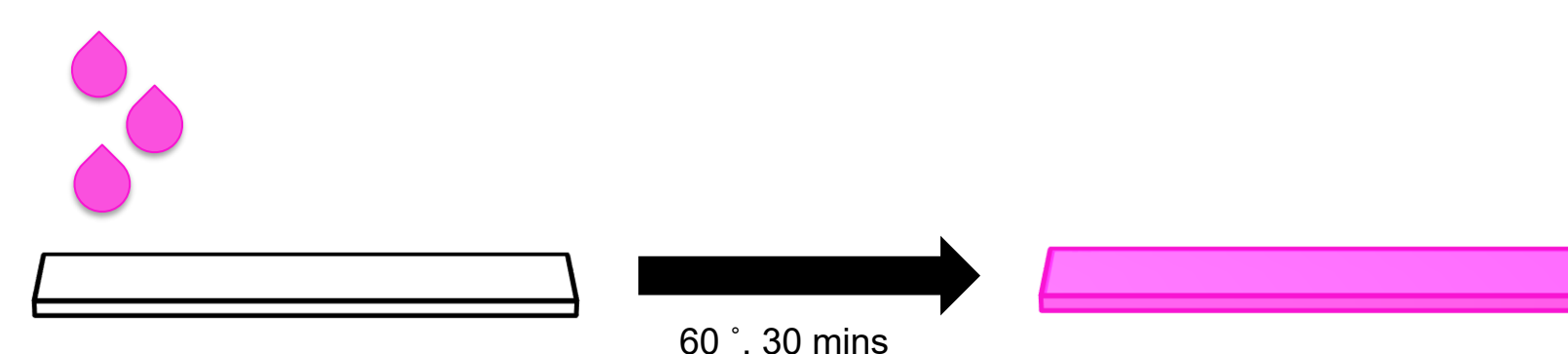


Figure 6: A schematic of the process of grafting Rh6G@UiO-66-NH₂ on the functionalised FP.

5. Rh6G@UiO-66-NH₂ on paper does not respond to changing NO_2^- concentration and is removed from the filter paper.

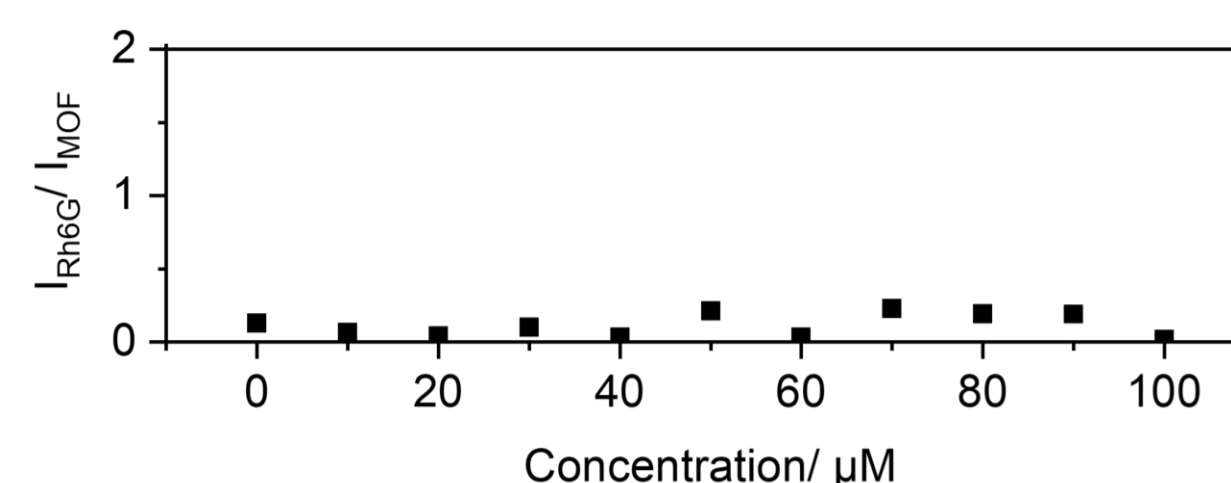


Figure 7: Fluorescence intensity ratio of Rh6G@UiO-66-NH₂-FFP with changing NO_2^- concentration. (Inset): the detection solutions after dipping Rh6G@UiO-66-NH₂-FFP for 15 minutes.

6. Future works of this research.

- The filter paper may be functionalised using a different method.
- If unsuccessful, there will be a literature search for an alternative MOF with more appropriate detection conditions.
- Once successful in grafting a MOF to FP, channels will be printed onto the MOF-paper and a casing built, resulting in a MOF-based μ PAD.

Acknowledgments.

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References.

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