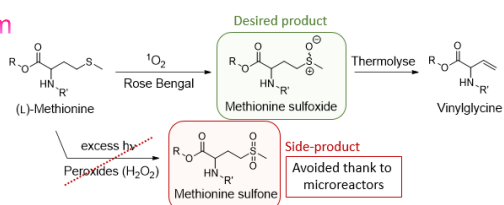


Figure 1:
Usual immersion well with a lack of homogeneous irradiation

1 | INTRODUCTION

Development of photochemistry in macroscopic **batch** reaction vessels is hampered due to inherent limitations: **superficial light penetration** and **poor heat exchange** result in inhomogeneous irradiation and hence to side-reactions or product degradation due to **overexposure**. The recent implementation of photochemical processes in **microreactors** under continuous-flow conditions appeared to be **much more powerful** than its batch analogue in terms of **irradiation efficiency**, light penetration and **excellent heat exchange**. Furthermore, the fine control of residence time ensures an accurate control of the irradiation time, avoiding side-reactions and degradation.

2 | Aim

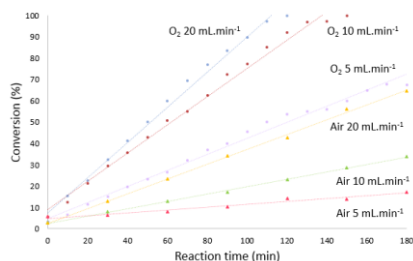


The aim was to **implement the photooxidation of (L)-methionine with singlet oxygen in microreactor** under continuous-flow conditions to avoid the formation of undesired side-product and improve the efficiency of the reaction.

3 | Photooxidation in batch immersion well

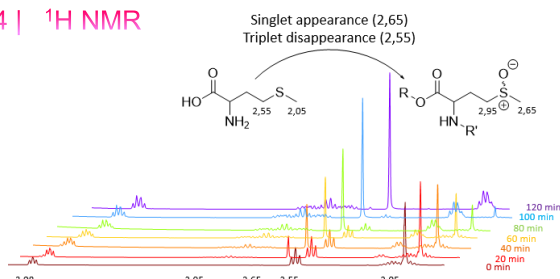


Methionine + Rose Bengal in water with O₂ or Air bubbling

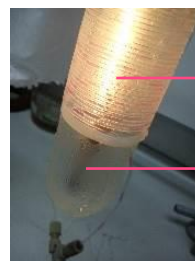
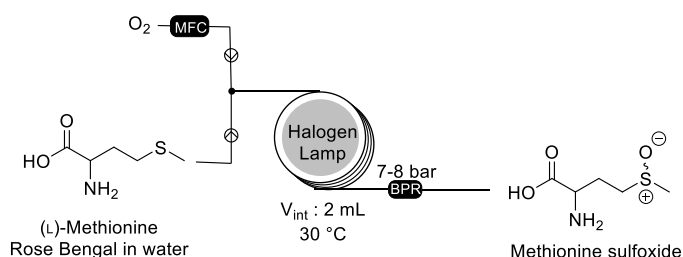


- ✓ ↗ [Rose Bengal]
 - ✓ ↗ lamp intensity
 - ✓ O₂ rather than air
- Total conversion in 2 h**

4 | ¹H NMR



5 | Microreactor



PFA tubing : easily exchangeable

Halogen lamp surrounded by cooling liquid



- ✓ Segmented flow
- ✓ O₂ excess

Total conversion in 2 min

6 | Results

Flow rates (mL.min ⁻¹)		Back Pressure Regulator (Bar)	Temperature (°C)	Residence Time (min)	Conversion
Substrat solution	O ₂				
0.5	15	7	30	2	Total

Total conversion of (L)-methionine into methionine sulfoxide could be reached in only **2 min**.

(Shorter residence times or lower O₂ flow rates were not sufficient and could not lead to total conversion)

7 | Conclusion

The photooxidation of (L)-methionine with singlet oxygen using Rose Bengal as a sensitizer was successfully implemented in a microreactor setup and led to total and selective conversion into methionine sulfoxide, an important building block for the organic synthesis of peptides or functionalized amino acid. The reaction was performed in **2 min** while the same reaction in batch took 2h.

8 | Acknowledgements

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