Polymeric Amines Induce Nitric Oxide Release: the Mechanism and Biomedical Applications

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Nitric oxide (NO) plays a crucial role in numerous physiological processes, including wound healing, cardiovascular disease, and cancer therapy.[1] Recently, we discovered a unique feature of polymeric amines for generating NO release.[2] However, the mechanism of NO release induced by these polymer materials is still poorly understood. Uncovering the mechanism will lead to a suite of polymers with significant potential for NO therapeutic delivery. In this study, we focus on the mechanisms of polymeric amines-induced NO release and their potential biomedical applications. To study the NO release mechanism, we synthesized a series of polymeric amines with varying molecular weights and degrees of branching. After confirming their ability to release NO, we used electron paramagnetic resonance (EPR) spectroscopy and isotope labelling to investigate the mechanism. Our results demonstrated that polymeric amines induced NO release in a controlled manner. The extent of NO release could be regulated by changing the composition of each type of amine and the relative molecular weight. These findings provide new insights into the design of polymeric materials for controlled NO release and have significant potential for various biomedical applications.

To explore the biomedical applications of NO generated by polymeric amines, we investigated their use in antibacterial surfaces. We functionalized different surfaces with the synthesized polymeric amines and assessed their antibacterial properties against two common bacterial strains, *Escherichia coli* and *Staphylococcus aureus*. Our results demonstrated that the polymeric amines induced a controlled release of NO on the surfaces, which resulted in significant antibacterial activity against both strains. Due to the versatility of NO, our synthesized polymeric amines also find applications in wound healing.

Overall, our findings provide guidance on the design of polymeric amines to generate therapeutic NO and highlight the potential of polymeric amines for developing antibacterial surfaces through the controlled release of NO. This approach has significant potential for various applications in the medical and healthcare industries.

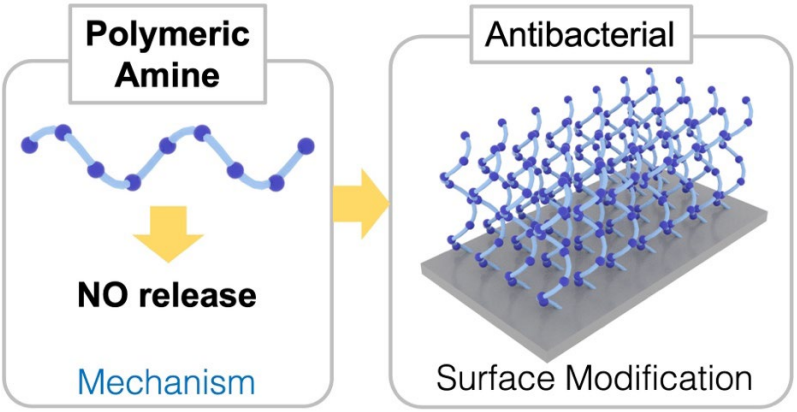

Figure 1: Polymeric amine-induced NO release and the biomedical applications.

References

[1] Yang, T.; Zelikin, A. N.; Chandrawati, R. *Advanced Science* **2018**, 1701043.
[2] Luo, Z.; Ng, G.; Zhou, Y.; Boyer, C.; Chandrawati, R. *Small* **2022**, 2200502.