Novel hybrid coating material with triple distinct healing bond for fat oil and grease deposition control in the sewer system

Sachin Yadav [1], Biplob Kumar Pramanik [2]

[1] School of Engineering, RMIT University, Australia, sachin.sachin@rmit.edu.au

[2] School of Engineering, RMIT University, Australia, biplob.pramanik@rmit.edu.au

1 INTRODUCTION

Fat, oil, and grease (FOG) is the primary culprit behind sewer blockages, accounting for approximately 50 % in the United States and a staggering 75 % in the United Kingdom. These blockages incur significant expenses for maintenance and rehabilitation, estimated at $25 billion in the US, £100 million in the UK, and A$100 million in Australia. This study presents a novel polyurethane elastomer designed with synergetic triple dynamic bonds, enabling spontaneous self-healing at 30 °C without external stimuli. To evaluate its practical utility, we investigated its effectiveness in reducing FOG deposition in sewer systems by applying it as a protective coating on concrete blocks. The findings highlight the potential of the Zn-polyurethane hybrid material for wastewater infrastructure applications, particularly in mitigating FOG-related blockages and corrosion in sewer systems.

2 METHOD

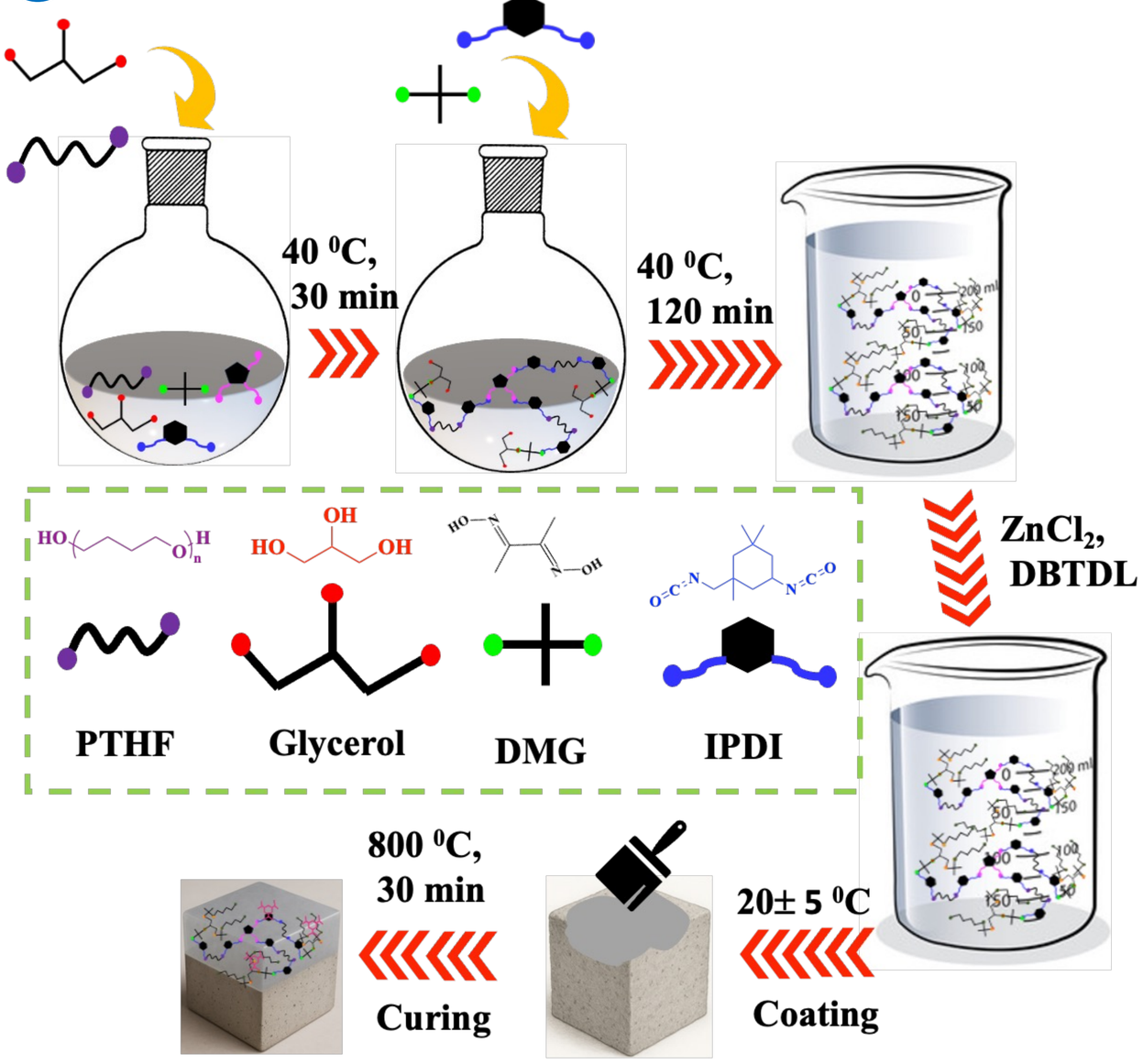
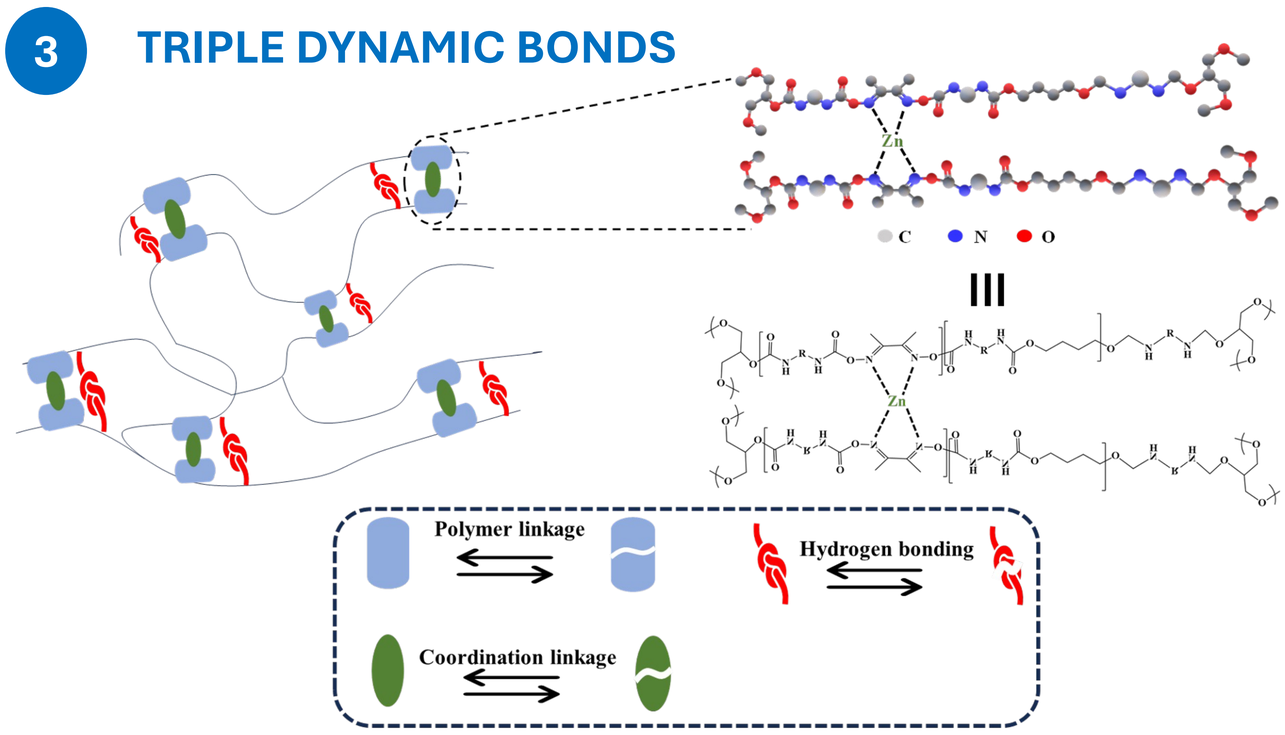


Fig. 1 Synthesis of coating.

3 TRIPLE DYNAMIC BONDS



4 RESULTS

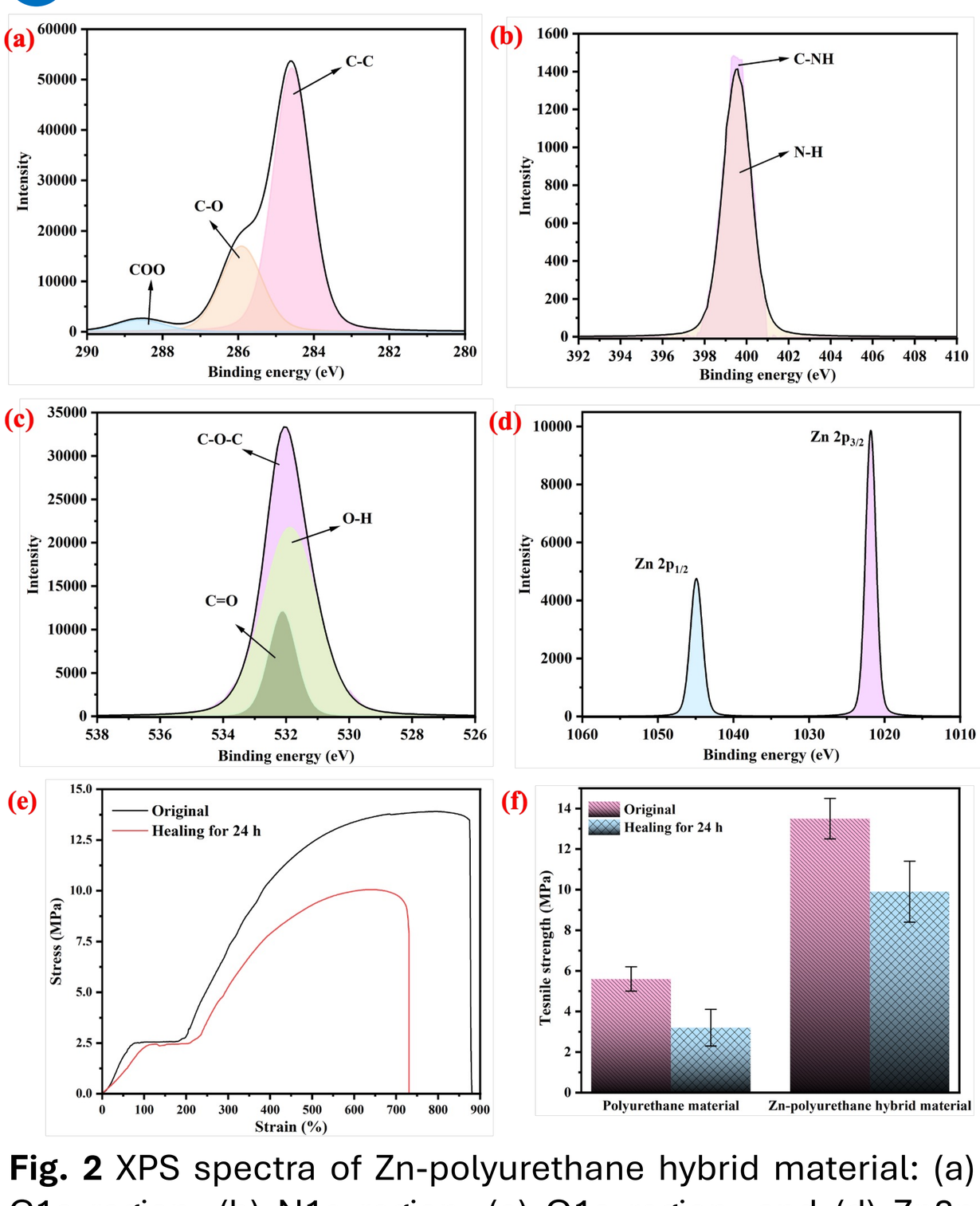


Fig. 2 XPS spectra of Zn-polyurethane hybrid material: (a) C1s region, (b) N1s region, (c) O1s region, and (d) Zn2p region; (e) Stress-strain curve and (f) Tensile strength for polyurethane coatings.

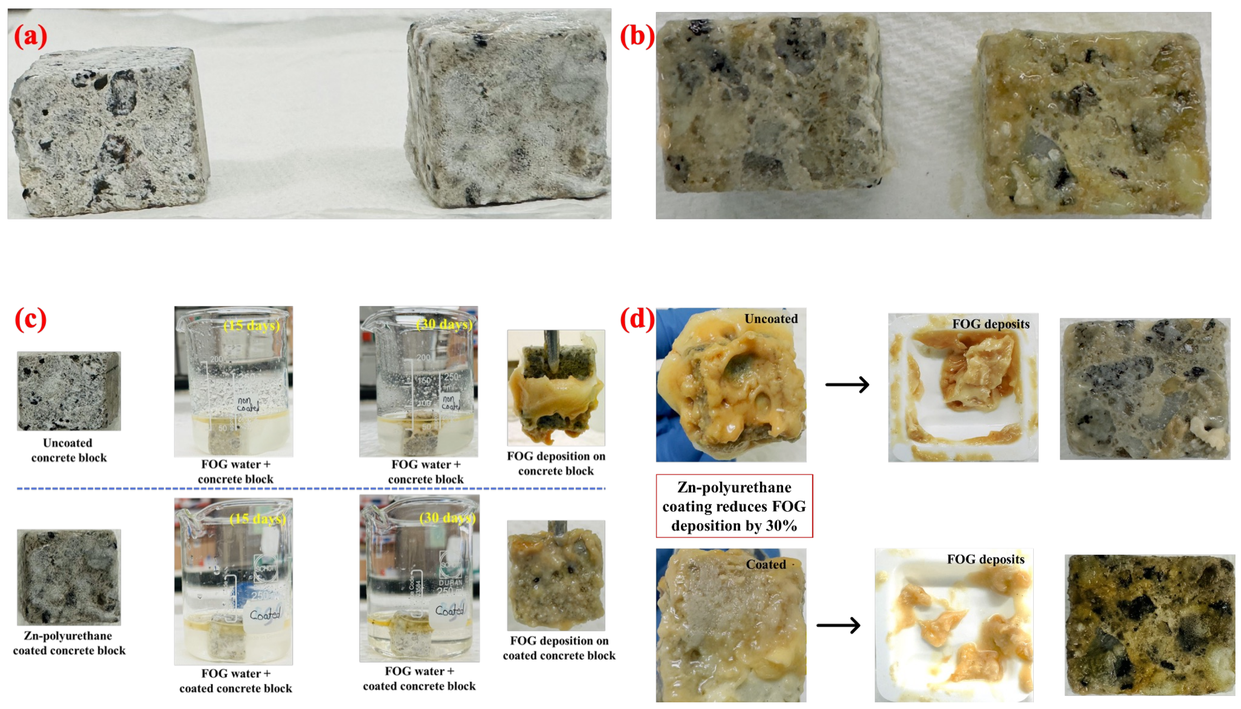


Fig. 3 FOG control test for 30 days.

5 CONCLUSIONS

1. Zn-polyurethane contains three distinct dynamic bonds.
2. The Zn-polyurethane material exhibits excellent water and thermal stability up to 850 °C.
3. A reduction of over 30% in FOG deposit formation on coated concrete samples.

ACKNOWLEDGEMENT We would like to acknowledge RMIT University for its support for this research.

REFERENCES Yadav and Pramanik (2024), Chemical Engineering Journal, 156226.