Study on Self-healing Intumescent Flame-retardant Coating

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Introduction

Intumescent flame-retardant coating (IFC) is a feasible method for passive protection against fire to steel and wood that cannot be internally flame-retardant modified.[1-3] However, due to the external environment and man-made destruction, the performances of coating would decrease. Herein, the reversible bond was introduced into the curing system of epoxy resin (EP) through molecular design to construct an adjustable covalent network between curing agent, epoxy resin and flame retardants. The high-performance EP coating that was both intumescent flame retardant and self-healing property.

Method

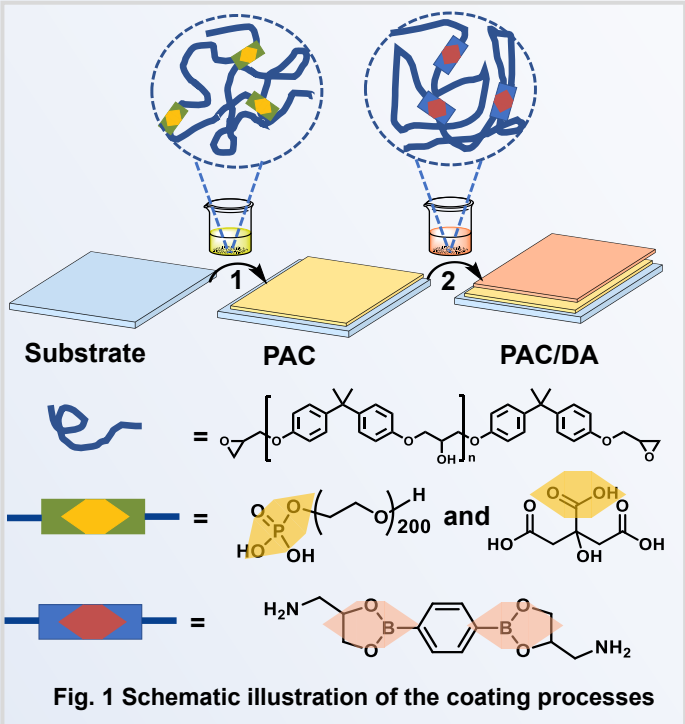

Fig. 1 Schematic illustration of the coating processes

Flame-retardant properties

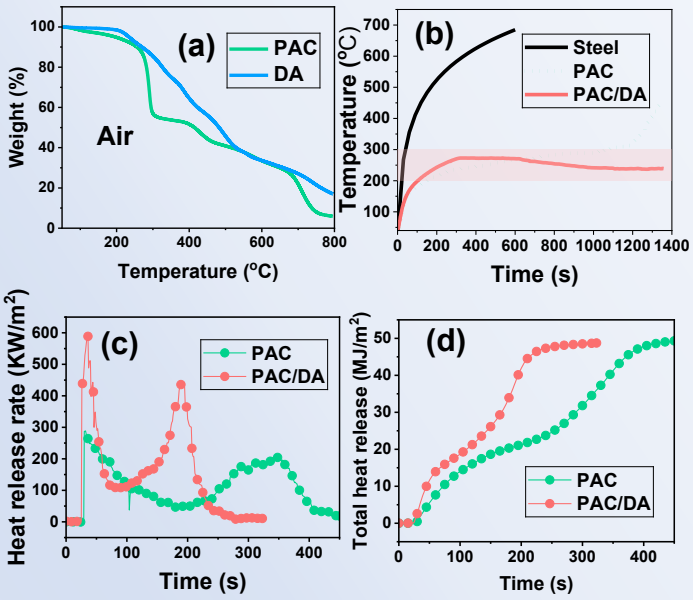

Fig. 2 TG curves of PAC and DA (a), the results of big panel test (b), the results of CC test (c, d)

Self-healing properties

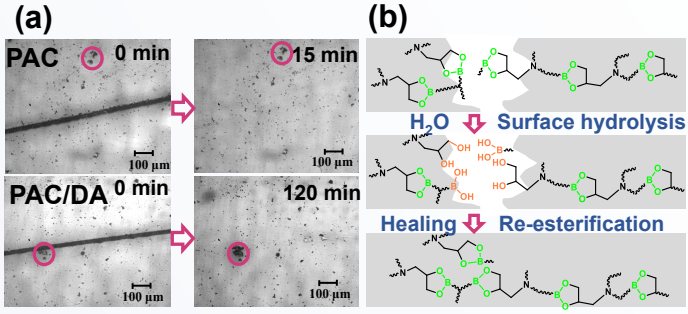

Fig. 3 The self-healing process of coatings at 85 °C (a), the proposed mechanism of healing of DA (b).

Water resistance and transparency

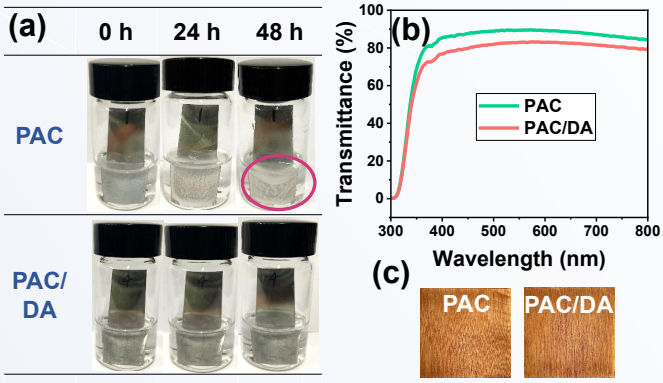

Fig. 4 The results of water resistance test (a), Transmittances of coatings (b), digital photos of coatings applied on plywood (c).

Conclusion

- Better thermal insulation during combustion for steel.
- Good self-healing properties
- Enhanced water resistance
- Without sacrificing transparency

Reference

[1] 1. Price, E. J.; Covello, J.; Tuchler, A.; et al., *ACS Appl Mater Interfaces* 2020, 12 (16), 18997-19005.
[2] Hu, X.; Sun, Z.; Zhu, X.; et al., *Coatings* 2020, 10 (2), 109.
[3] Wang, Y.; Zhao, J., *Construction and Building Materials* 2020, 236, 117433.