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Scratch resistance of silicone elastomer coatings

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Silicone elastomer coatings possess good thermal and oxidation stability, flexibility, hydrophobicity, and low surface energy.^[1] Due to these properties, they are commonly used as a protective coating; for example for roofs, ships, offshore structures, and power grids. In order to ensure longevity and efficiency of these applications, the coating must also have high scratch resistance. The scratch resistance of silicone elastomer coatings is usually enhanced by the addition of fillers.^[2] Nevertheless, this reinforcement often comes together with deterioration of some of the favorable properties of the silicone elastomers.

In this work, unfilled silicone elastomer coatings are investigated. The coatings are prepared by a condensation curing reaction between hydroxyl-terminated PDMS and a cross-linker with alkoxy functional groups (Figure 1). The scratch resistance and elastic recovery of the prepared coatings are measured by Nano Scratch Tester (NST³) and Nano Indentation Tester (UNHT³), respectively. We showed that by choosing an appropriate type and concentration of the cross-linker, unfilled silicone elastomer coatings can outperform the scratch resistance of commercial silicone coatings containing fillers.

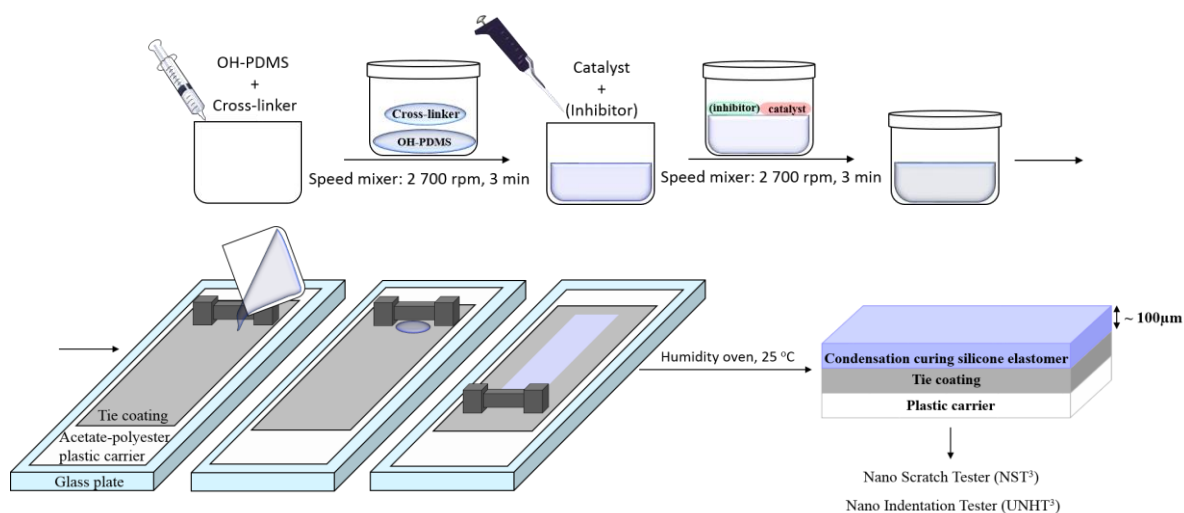


Figure 1: Schematic illustration of the condensation curing silicone elastomer coating preparation.

[1] Eduok, U., Faye, O. & Szpunar, J. *Prog. Org. Coatings* **111**, 124–163 (2017).

[2] Madsen, F. B., Daugaard, A. E., Hvilsted, S. & Skov, A. L. *Macromol. Rapid Commun.* **37**, 378–413 (2016).