

Supplementary Materials

Preparation of Resin Samples

E51 and modified 650 curing agent were mixed by stirring in a beaker with a mass ratio of 1.8:1 at room temperature to obtain a cured DEGBA/modified 650 homogeneous solution. Then it was poured into a silica gel abrasive and finally placed in an oven at 40 °C for 12 hours to obtain the E51 / modified 650 solid specimen. The reaction mechanism is shown in Fig. S1.

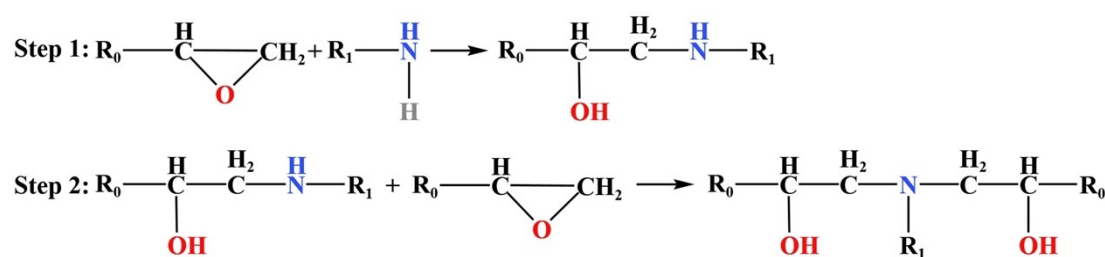


Fig. S1 Reaction mechanism of epoxy resin and amine curing agent

Formulas

The material removal rate (MRR) of CMP was calculated by Eq. (S1).¹

$$MRR = \frac{\Delta m \times 10^7}{\rho S t} \quad (S1)$$

Here, Δm represents the mass difference of the resin before and after polishing, $\rho = 1.17$ g/cm³ is the density of the resin, S is the contact area between the resin and the polishing pad, and t is the polishing time.

The free volume fraction (FFV) is defined as Eq. (S2):²

$$FFV = \frac{V}{V + V_{EP}} \quad (S2)$$

where FFV is the volume fraction, V_{EP} is the volume occupied by the polymer chains, and V is the free volume.

Supporting Images

To quickly eliminate the resin surface edge protrusion caused by curing shrinkage, first, #3000 sandpaper was used to level it. The surface after treatment is shown in Fig. S2.

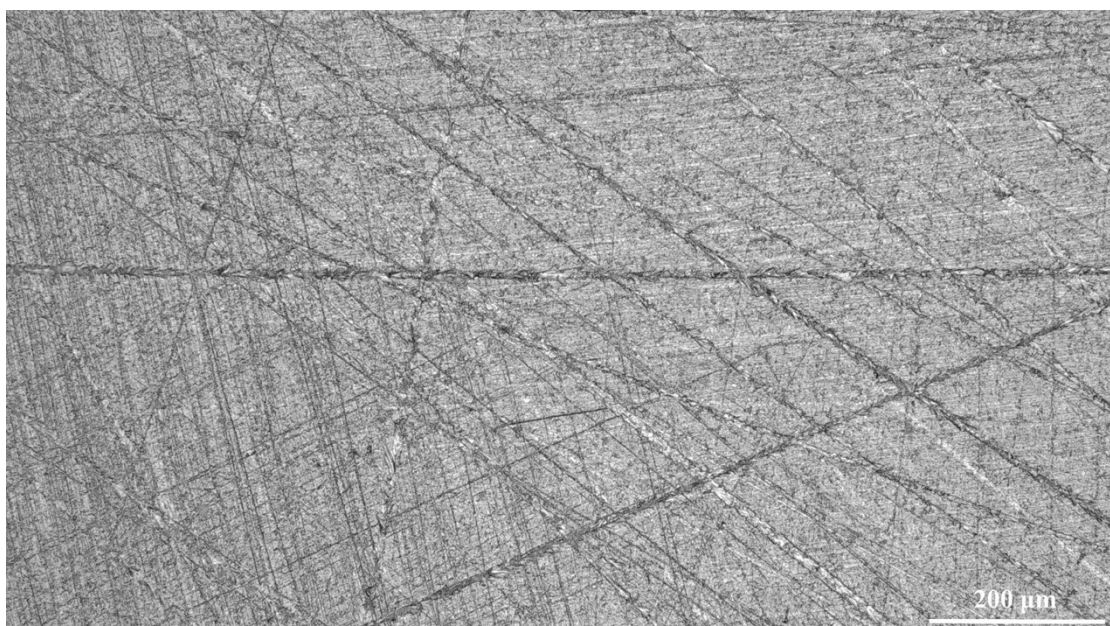


Fig. S2 Optical microscope image of the resin after grinding with #3000 sandpaper

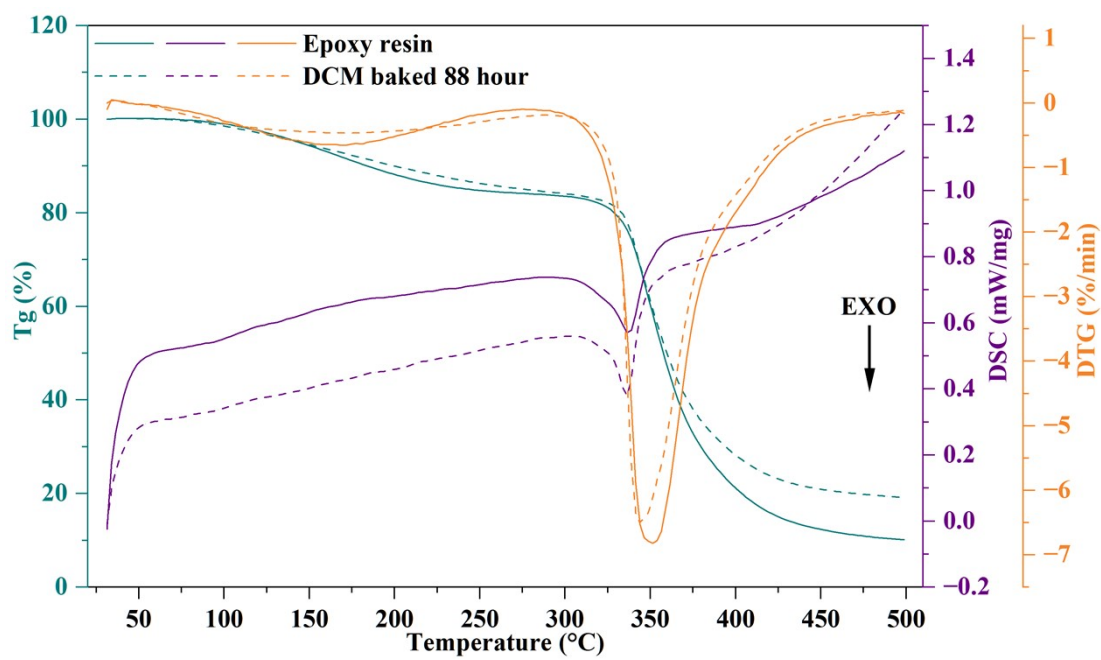


Fig. S3 Tg-DSC-DTG curves of the resin

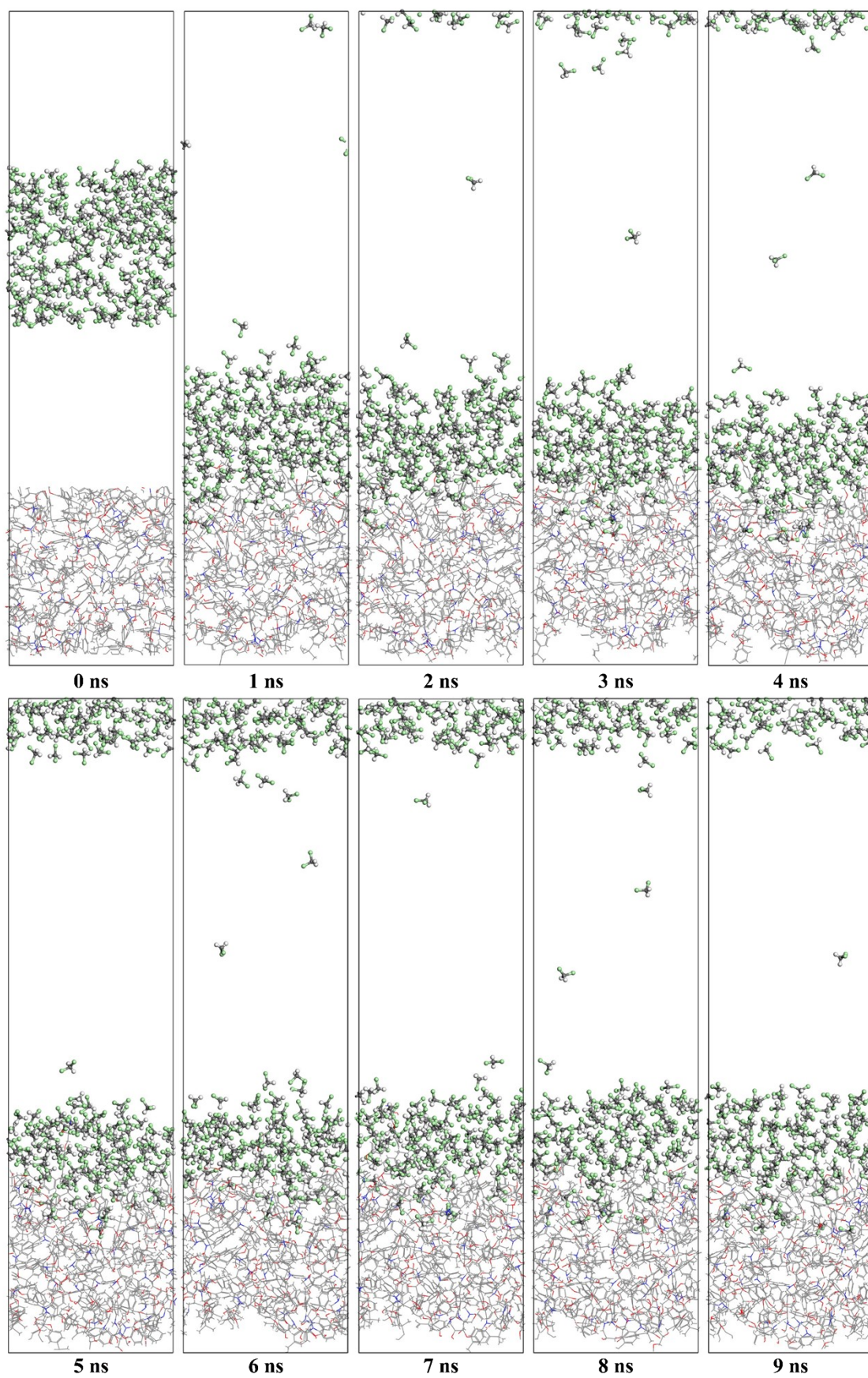


Fig. S4 Diffusion process of DCM in resin

References

- 1 G. Ren, L. Wang and S. Wang, *Colloids Surf., A*, 2025, **705**, 135764.
- 2 S. Yamamoto, R. Kuwahara and K. Tanaka, *Soft Matter*, 2021, **17**, 6073-6080.