Supplementary Information

Acrylic coatings with surprising antifogging and frost-resisting properties

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Synthesis and properties of poly(MMA-co-DMAEMA)

The poly(MMA-co-DMAEMA) copolymers were synthesized by free radical solution polymerization. Methyl methacrylate (MMA) and 2-(dimethylamino)ethyl methacrylate (DMAEMA), with different DMAEMA contents (50, 60, 70, and 80 mol%), were first dissolved in ethanol (10 wt%) in a 250-mL flask, followed by the addition of AIBN (the initiator, 0.5 wt% with respect to the total monomer mass). The reaction solution was then purged by Argon for 20 min, and the polymerization was carried out at 70 °C for 24 h. After polymerization, the product was precipitated and washed in hexane to remove possible unreacted monomer. The resultant copolymer was dried at 50 °C for 48 h in a vacuum oven. The content of the DMAEMA unit in the purified copolymers was determined by ^{1}H-NMR to be 50%, 58%, 67% and 76%, respectively, which agreed with the theoretical values (50, 60, 70, and 80 mol%) quite well. Typical properties of the copolymers are listed below.

Physical properties of poly(MMA-co-DMAEMA) copolymers

	M_n	PDI	T_g (^{o}C)
Copolymer-80	20000	3.2	29
Copolymer-70	21000	2.5	40
Copolymer-60	29000	1.8	54
Copolymer-50	33000	1.9	62

(Molecular weight determined by GPC, again PS standards; T_g by DSC)

Preparation of copolymer coatings with PEGDMA cross-linked network

Ethylene glycol dimethacrylate (EGDMA, at 0.1, 0.5, 1.0 and 2 wt% relative to the copolymer) was co-dissolved with the copolymer in toluene (10 wt%), followed by the addition of a UV initiator, 2-hydroxy-4'-(2-hydroxyethoxy)-2-methyl propiophenone (1 wt% relative to EGDMA). The solution was then spin-coated on clean glass slides (1.5cm × 1.5cm) at 500 rpm for 15 s. The coating was cured under UV irradiation in a UVP CL-1000 Ultraviolet Crosslinker apparatus (365 nm, 15 w) for 45 min, and dried in a vacuum oven overnight. The final coatings were labeled as Copolymer-50, Copolymer-60, Copolymer-70, and Copolymer-80, respectively, depending on the molar content of the DMAEMA content.

Control glass

Glass slides (1.5 cm × 1.5cm) were cleaned ultrasonically for 5 min, and then placed in a freshly prepared solution of concentrated H_2SO_4 and 30 vol% H_2O_2 (7/3, v/v) at 80 °C for 1 h to remove organic contaminants and generate free hydroxyl groups on the surface. The glass slides were then rinsed with ultrapure water and ethanol, and dried with airflow.

Rf-modified glass

To render glass slides hydrophobic, the cleaned slide was chemically modified with *1H,1H,2H,2H*-perfluorodecyl trichlorosilane via the chemical vapor deposition at 100 °C for 20 min in sealed vials. At the end of reaction, the treated slides were rinsed with anhydrous toluene, sonicated for 5 min to remove residue, and then dried in an oven at 100 °C for 30 min. The hydrophobic glass slide was labeled as Rf-modified glass in the manuscript.