

Surfactant-free HEMA Crystal Colloidal Paint for Structural Color Contact Lens

Panmiao Liu,¹ Zhuoying Xie,^{1,2,*} Fuyin Zheng,¹ Yuanjin Zhao,¹ and Zhongze Gu^{1,2,*}

¹State Key Laboratory of Bioelectronics, School of Biological Science and Medical Engineering, Southeast University, Nanjing, China, 210096

²Suzhou Key Laboratory of Environment and Biosafety, Research Institute of Southeast University in Suzhou, Suzhou, China, 215123

Experimental Section

Table. S1 Polymerization condition for PMH nanoparticles

Sample	Water (ml)	MMA (ml)	DVB (ml)	HEMA (ml)	APS (g)	NaCl (g)	Diameter (nm)
No. 1	160	5.0	0.35	0.400	0.08	0.04	150
No. 2	160	4.0	0.28	0.400	0.08	0.04	120
No. 3	160	3.5	0.25	0.400	0.08	0.04	110
No. 4	160	3.5	0.25	0.438	0.08	0.04	90
No. 5	160	3.5	0.25	0.470	0.08	0.04	50

Table. S2 The atomic concentrations of C1s and O1s and the O1s/C1s ratio of the PMMA and PMH nanoparticles by XPS

characterize

	C1s(%)	O1s(%)	O1s/C1s
PMMA Nanoparticles	73.02	26.98	0.369
PMH Nanoparticles	72.32	27.68	0.383

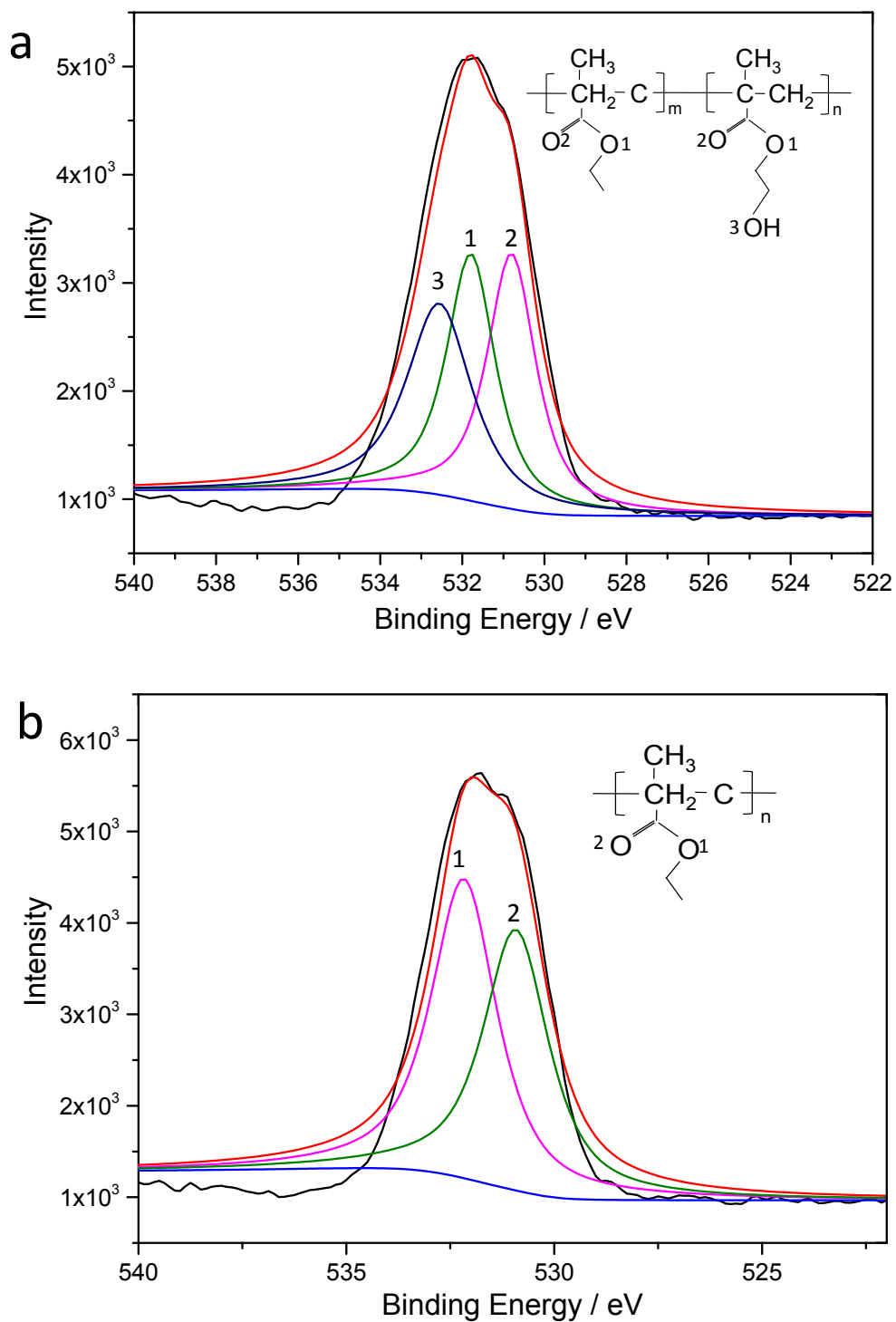


Fig. S1 XPS analysis of decomposition of the O1s peak of the PMH nanoparticles(a) and PMMA nanoparticles(b). The O1s(1), O1s(2) and O1s(3) peaks were respectively assigned to bridging oxygen atoms (C-O-CH₃) and carbonyl oxygens of the methyl esters groups and hydroxyl oxygen of the surface of PMH particles. Beside, the black line is survey spectrum, the red line is fit spectrum by summing the spectra in each of the colored zones, and the blue line is background line.

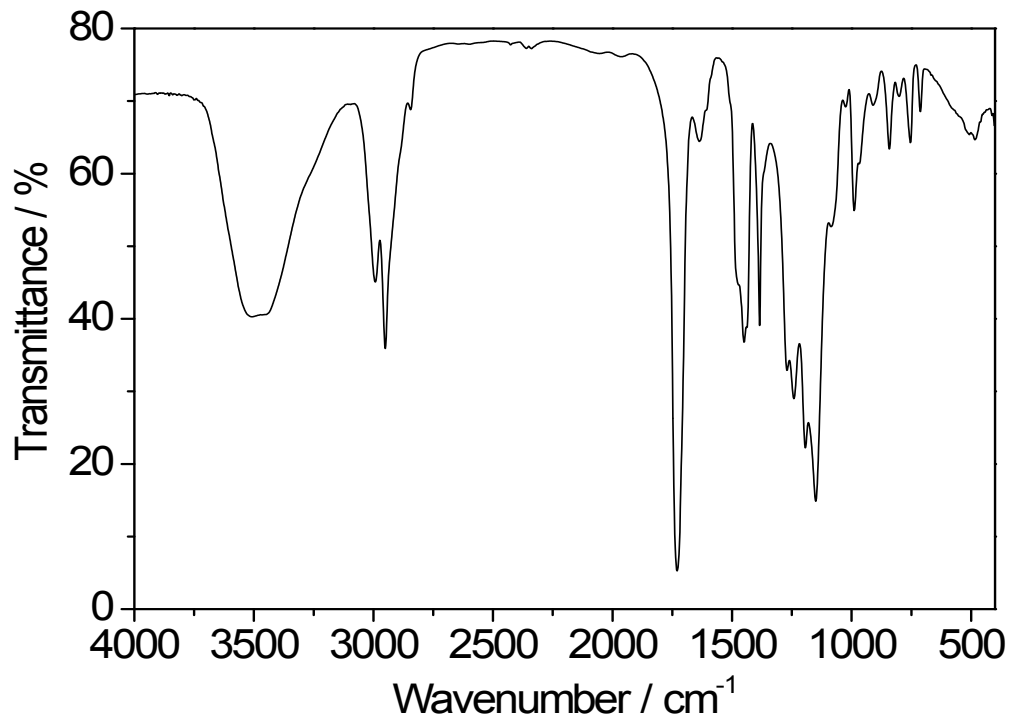


Fig. S2 FTIR spectrum characterization of the PMH particles.

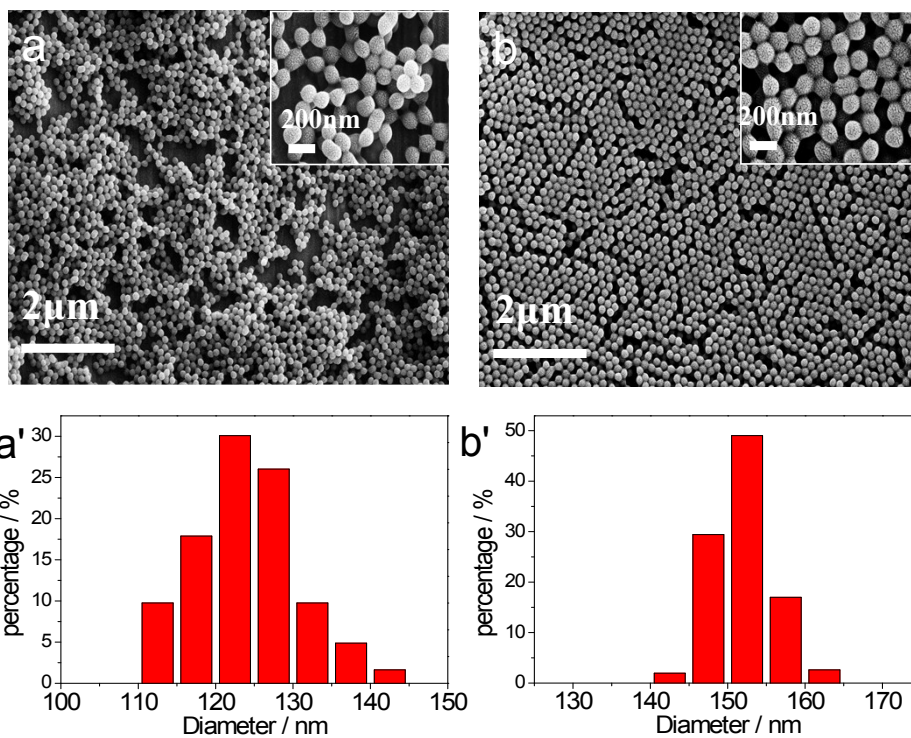


Fig. S3 (a-b) FESEM image of the 110 nm and 150 nm PMH nanoparticles, the inset is magnified image and the bar is 200 nm.

(a'-b') Corresponding size distribution of the nano-particles with average diameter.

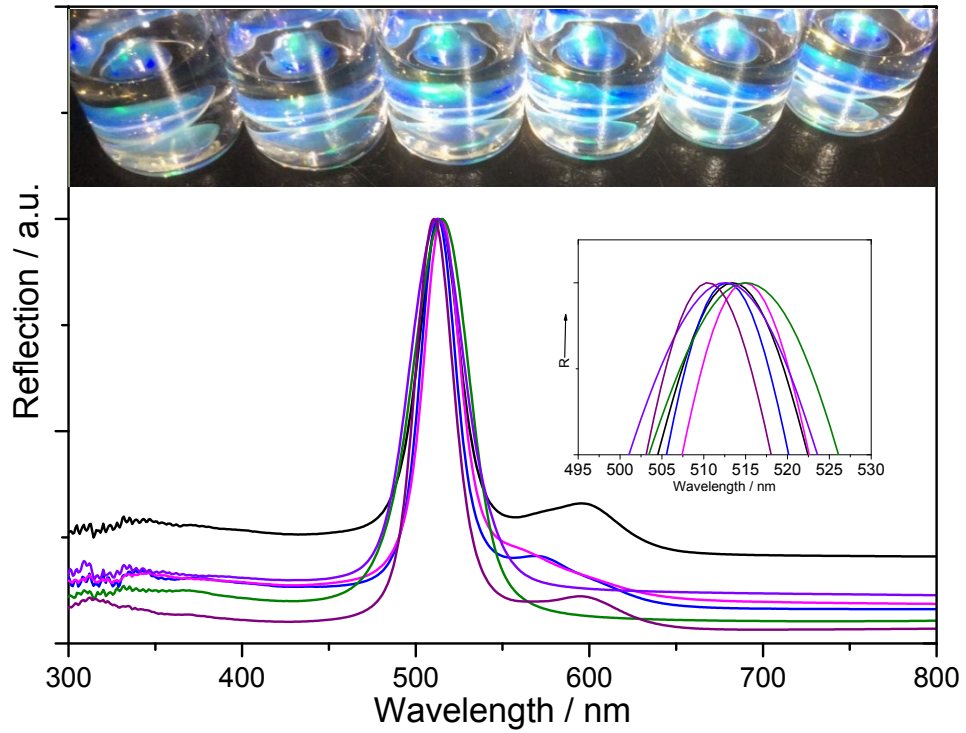


Fig. S4 The reflection spectra of different batches with the same green colored paints and the part amplification to the spectra. The top picture is the corresponding six colored contact lenses samples.

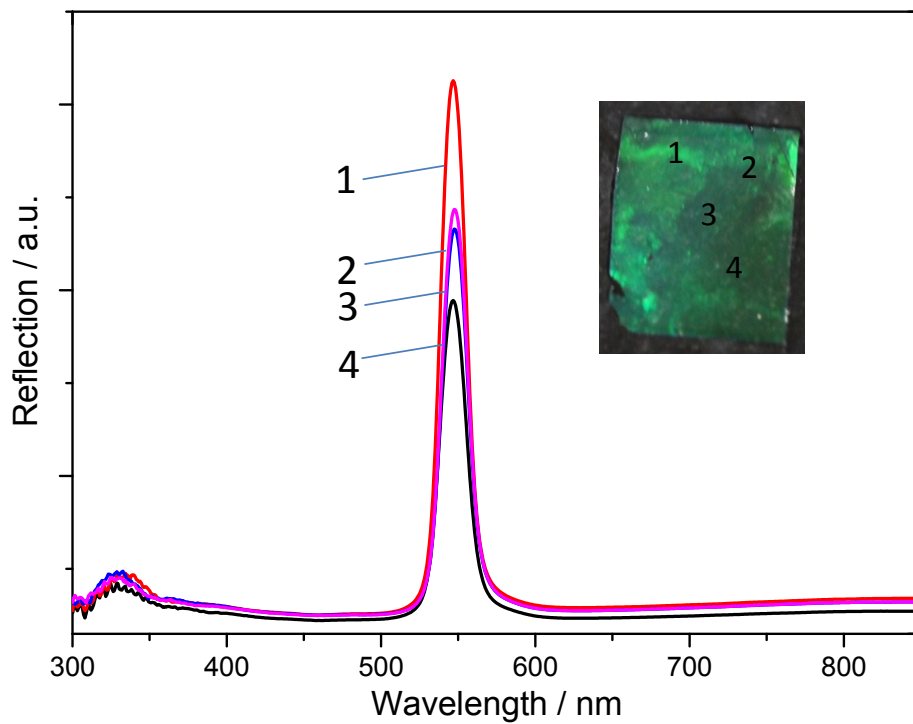


Fig. S5 The reflection spectra of different four points for green color film and the insert image of the positions for the four points in the film.

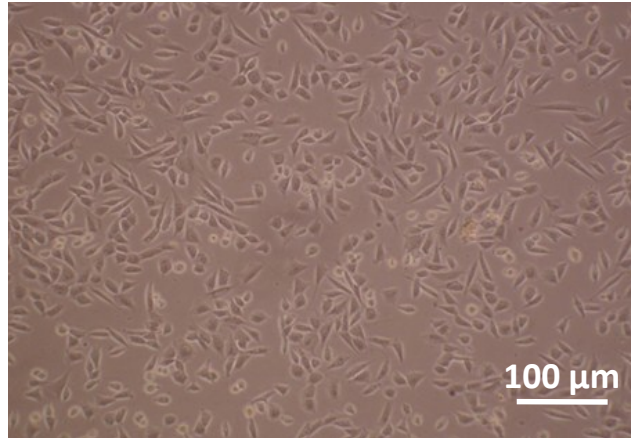


Fig. S6 The optical photograph of nature fibroblast morphology cultured in petridish.

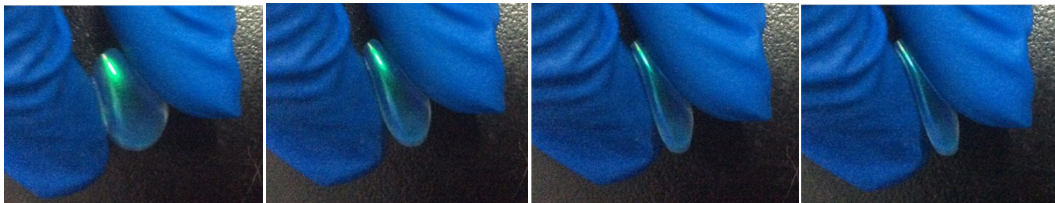


Fig. S7 The performance of soft contact lenses with different degree bending test.