Supplementary Information (SI) for Journal of Materials Chemistry C.

Supporting information

Design and fabrication of elastic bilayer fabrics with dual functions: superior asymmetric liquid management and real-time wearable monitoring

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Figures

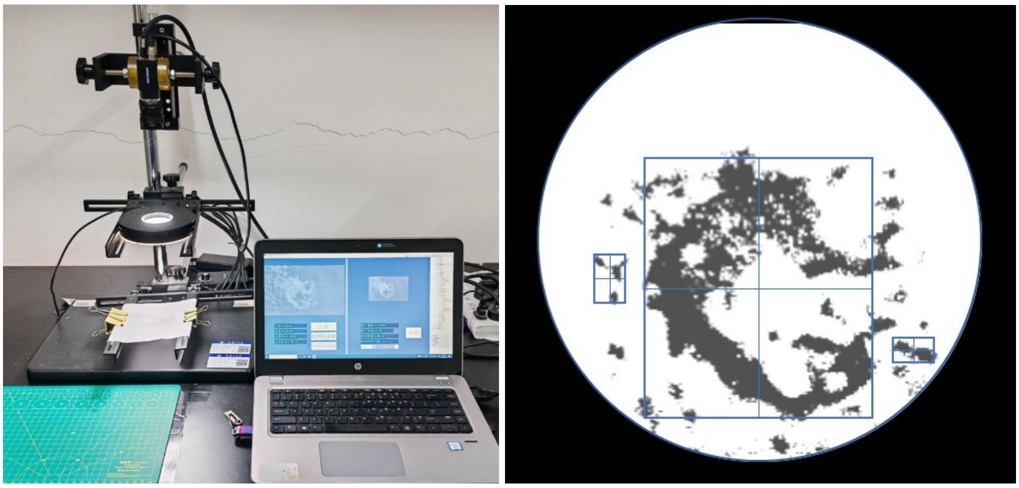
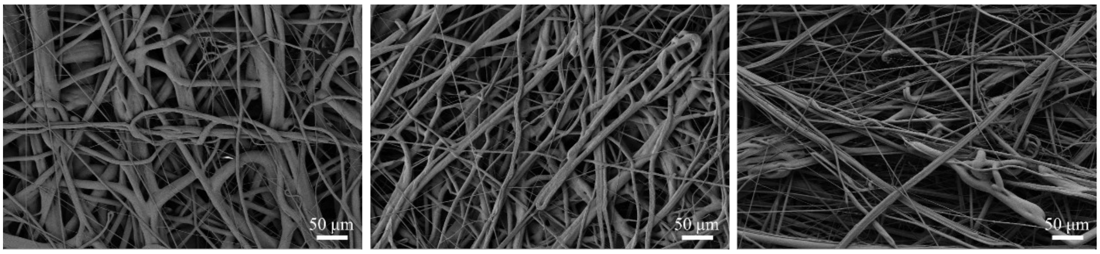
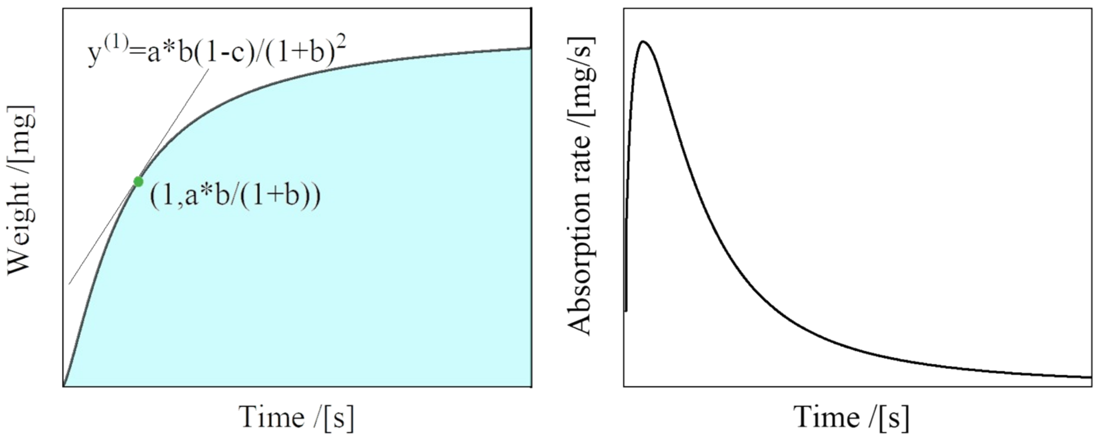


Figure. S1 Physical picture of liquid climbing and liquid diffusion testing instrument



（a） *Ap*-22 kPa （b） *Ap*-26 kPa （c） *Ap*-30 kPa

Figure. S2 CEL/ POE@SAS fibric POE@SAS microscopy image of the surface of microfiber layer



（a） （b）

Figure. S3 Classic curves of asymmetric liquid transfer test (a) absorption weight-time and (b) absorption rate-time

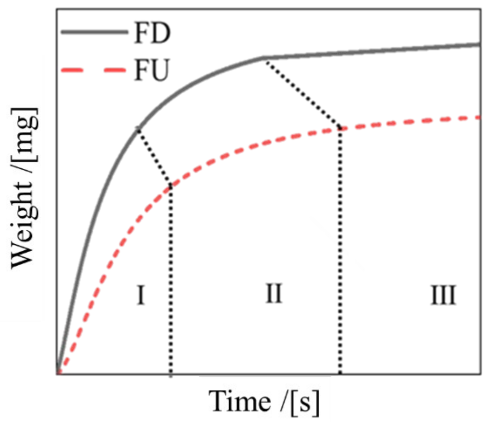


Figure. S4 Classic absorption weight- time curve of asymmetric liquid delivery test

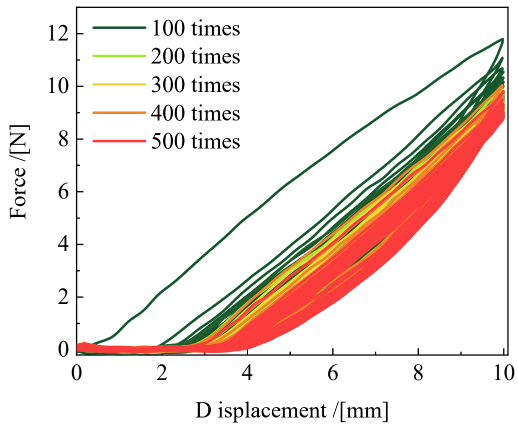


Figure.S5 500 times constant elongation tensile recovery curve of sample *Ap*-22.

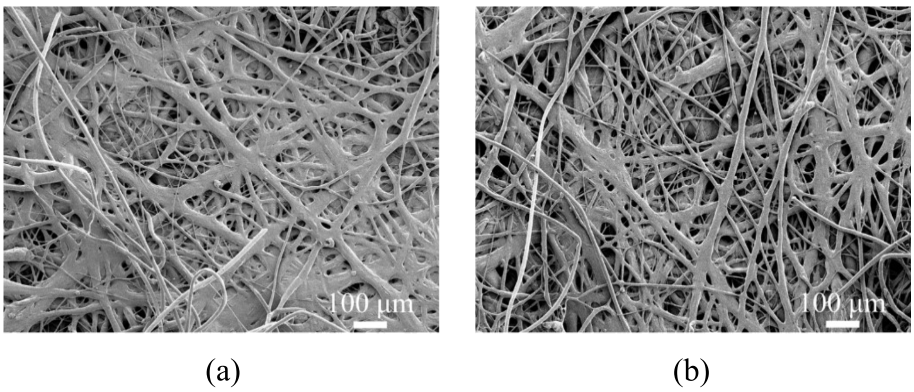


Figure S6. SEM images of the POE@SAS microfiber layer: (a) before stretch-recovery testing; (b) after 500 cycles of stretch-recovery testing.

Figure. S7 Subject's motion trajectory diagram and motion pace diagram

Tables

Tables. S1. Main melt blowing process parameters

Machine	Paraments		Setting
Extruder	Diameter = 25 mm, L/D =28:1	Zone 1	230 ℃
		Zone 2	260 ℃
		Zone 3	280 ℃
Pump	45 ml/min，9ml/r		280 ℃
Melt blowing Die	Pore diameter = 0.25 mm, L/D =10:1, Pore density=76/5cm		280 ℃
High-speed Air	Temperature		280 ℃
	Pressure		20 kPa
Collector	DCD		20 cm
	drafting ratio		1

note: DCD = die to collector distance, L/D = length/diameter.

Tables. S2. ATOL related parameters under different *Ap*

Ap	*Lcs* =CEL comfortable layer				*Lcs* =POE@SAS microfiber layer			
	A（%）	*Ve*（mg/s）	*Vm*（mg/s）	*Va*（mg/s）	*A*（%）	*Ve*（mg/s）	*Vm*（mg/s）	*Va*（mg/s）
18	1078.2	0.98	83.3	26.9	641.4	8.1	77.8	16.9
22	977.4	2.4	111.6	37.2	372.9	7.2	23.1	15.9
26	1566.3	6.3	151.9	32	927.9	4.2	48.7	21.7
30	1743.3	7.1	181.2	36.3	919.5	7.3	71.1	21.6
34	1012.8	3.5	152.4	23.2	768.6	8.7	48.8	16.6

Tables. S3. ATOL related parameters under different M_{SAS}

M_{SAS}	*Lcs* =CEL comfortable layer				*Lcs* =POE@SAS microfiber layer			
	A（%）	*Ve*（mg/s）	*Vm*（mg/s）	*Va*（mg/s）	*A*（%）	*Ve*（mg/s）	*Vm*（mg/s）	*Va*（mg/s）
1	976.8	4.8	43.8	21.9	1188.3	3.3	63.1	23.3
1.5	1116	2.6	57.8	21	1351.8	0.8	95.8	23.3
2	1107	2.4	66.7	20.1	860.4	5	37.5	20.2
2.5	1470.3	3.3	102.4	26.2	1094.1	5.2	50.4	24.7

Tables. S4. Parameters related to constant elongation and stretching under different *Ap*

Ap	MD		CD	
	Elastic recovery rate /(%)	Plastic deformation rate /(%)	Elastic recovery rate /(%)	Plastic deformation rate /(%)
18	43.7	11.3	56.1	8.8
22	48.5	10.3	61.0	7.8
26	34.9	13.0	57.1	8.6
30	47.4	10.5	55.7	8.9
34	34.9	13.0	31.9	13.6

Equations

Equations S1. Porosity refers to the percentage of the internal pore volume in the total volume of nonwoven materials. Fabric porosity is calculated according to the mass per unit area, thickness and density of the sample, and the calculation equation is shown as follows:

$$p = [1 - m/\rho_f\delta] \times 100\%$$

$$\rho_f = \sum_{i=1}^{n} \rho_i \omega_i \quad (i = 1,2,3\ldots)$$

Where p is the fabric porosity, m is the mass per unit area, ρ_f is fiber density, ρ_i is material density, ω_i is the mass fraction of the material component, δ is the sample thickness.

Equations S2. The Langmuir equation and its extended forms are widely employed to describe monolayer or multilayer adsorption behaviors of liquids on solid surfaces, with these theoretical models being established upon a series of key assumptions. The extended LangmuirEXT1 isothermal adsorption equation incorporates critical assumptions including multilayer adsorption, heterogeneous adsorption sites, and intermolecular interactions among adsorbed molecules, enabling more accurate description of actual adsorption processes and demonstrating superior suitability for characterizing complex adsorption phenomena. The LangmuirEXT1 isothermal adsorption equation is presented as follows:

$$U= \quad y = \frac{abx^{1-c}}{1 + bx^{1-c}}$$

Where U (i.e., y) represents the response variable of LangmuirEXT1, denoting adsorption capacity (unit: mg). Parameter a signifies the adsorption rate constant, characterizing the apparent rate constant during adsorption. Parameter b denotes the interaction constant, reflecting the interaction strength between adjacent adsorption sites. Variable x represents the independent variable of LangmuirEXT1, indicating adsorption time (unit: s). Parameter c constitutes the exponential term in LangmuirEXT1, describing the nonlinear adsorption process.