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Supplementary Information

Trash into Treasure: stiff, thermally insulating and highly conductive carbon aerogels from leather wastes for high-performance electromagnetic interference shielding

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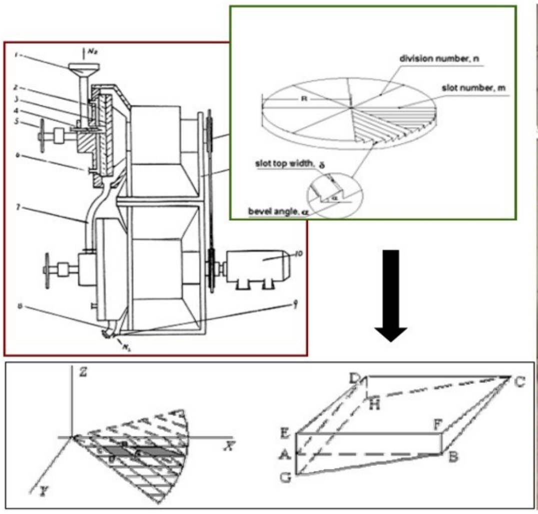

(a) (b)

(c)

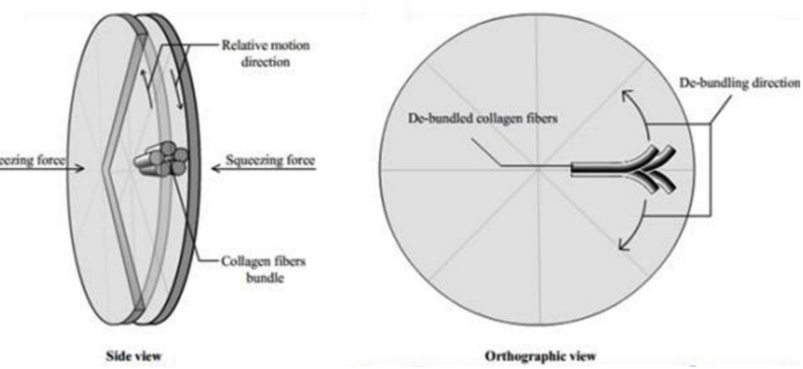

Fig.S1 Schematic diagram of S^3M reactor (a) and the photograph of S^3M equipment[1]. (c) is the failure mechanism of leather fiber in S^3M reactor[2].

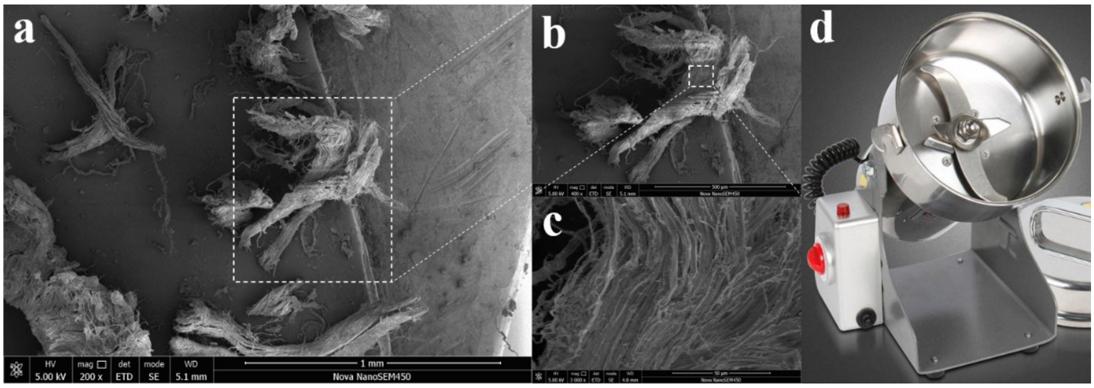

Fig.S2 SEM photos of LWs broken by high-speed crusher (a,b,c); the digital photo of high-speed crusherd (d).

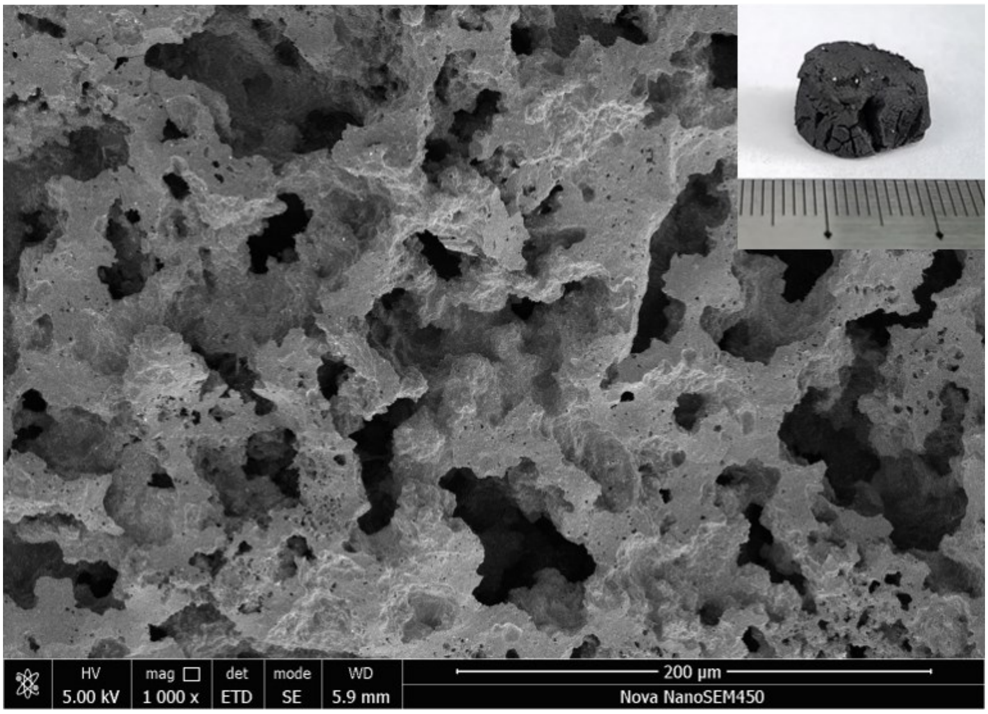

Fig.S3 SEM image and actual photo of 2LWs-3PVA CAs

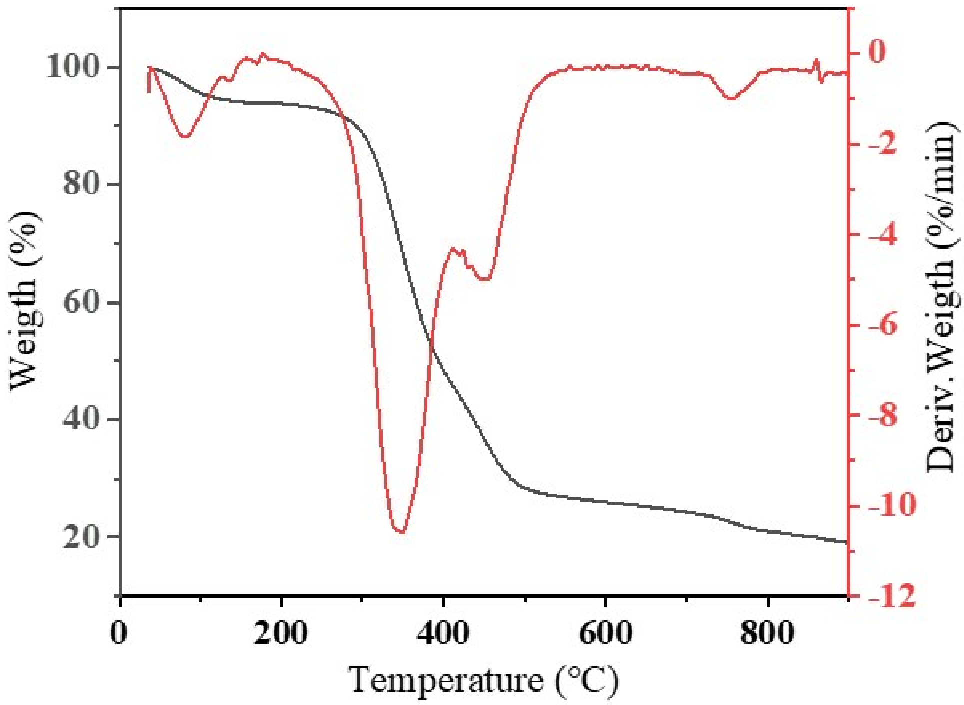

Fig.S4 TG/DTG image corresponding to the TG-IR in Figure.4a.

Eq.S1:

The porosity (P) is calculated using the following equation:

$$P = \left(1 - \frac{\rho_0^{'}}{\rho}\right) \times 100\%$$

Where $\rho_0^{'}$ is the bulk density and ρ is the skeletal density of the prepared CAs.

Eq.S2:

$$\delta = (\sqrt{\pi\mu f\sigma})^{-1}$$

Here, f is the frequency, σ is the electrical conductivity, μ is the magnetic permeability of CAs ($\mu = \mu_0\mu_r$, μ_0=4π×10^{-7} H/m, μ_r is the relative permeability of the material, μ_r=1 for the nonmagnetic CAs).

Tab.S1 The main components of liquid products during pyrolysis.

Peak Area (%)	Compounds Name	Similarity Index
26.82	Acetic acid	97
14.91	Acetamide	97
5.35	Carbamic acid, methyl-, 3-methylphenyl ester	73
4.74	N-methyl-acetamid	80
3.95	2-Piperidinone	84
3.77	Phenol	93
3.42	1H-pyrrole-2-carbonitrile	88
3.14	Propanamide	92

Tab.S2 EDS analysis of elemental composition and content before and after pyrolysis

Elements	Proportion before pyrolysis (wt%)	Proportion after pyrolysis (wt%)
C	49.47	64.78
O	19.75	10.95
N	14.85	4.01
S	0.93	3.32
Na	2.44	6.56
Ca	0.21	1.52
Cr	5.3	2.97
Cl	7.05	5.89

Tab.S3 Comparison of TASSE of various carbon-based materials

Carbon materials	TASSE ($dB\ cm^2\ g^{-1}$)	Frequency	References
Aerogel-like carbon from sugarcane	421.49	8.2-12.4 GHz	[3]
Carbon foam from sucrose and carbon nanotube	339.10	8.2-12.4 GHz	[4]
Carbon Foam Derived from Bread	16	6.0-12.4 GHz	[5]
Resorcinol-formaldehyde based carbon aerogels	526	8.2-12.4 GHz	[6]
Microcellular carbon foams from sucrose	389.43	8.2-12.4GHz	[7]
Porous graphene/polystyrene composites	256.7	8.2 GHz-12.4GHz	[8]
This work	605.85	8.2 GHz-12.4GHz	

References

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