Hydrophobic, Flexible Electromagnetic Interference Shielding Films Derived from Hydrolysate of Waste Leather Scraps

Dangge Gao[1,2,3*], Shihao Guo[1,2,3], Yingying Zhou[1,2,3], Bin Lyu[1,2,3], Ping Zhao[1,2,3], Jianzhong Ma[1,2,3]

（1. College of Bioresources Chemical and Materials Engineering, Shaanxi University of Science and Technology, Xi'an, China 710021; 2. National Demonstration Center for Experimental Light Chemistry Engineering Education(Shaanxi University of Science &Technology), Xi'an, China 710021; 3. Xi'an Key Laboratory of Green Chemicals and Functional Materials, Xi'an, China 710021)

***Corresponding Author: Tel.:+86-029-86132559; E-mail: dangge2000@126.com (D, Gao)**

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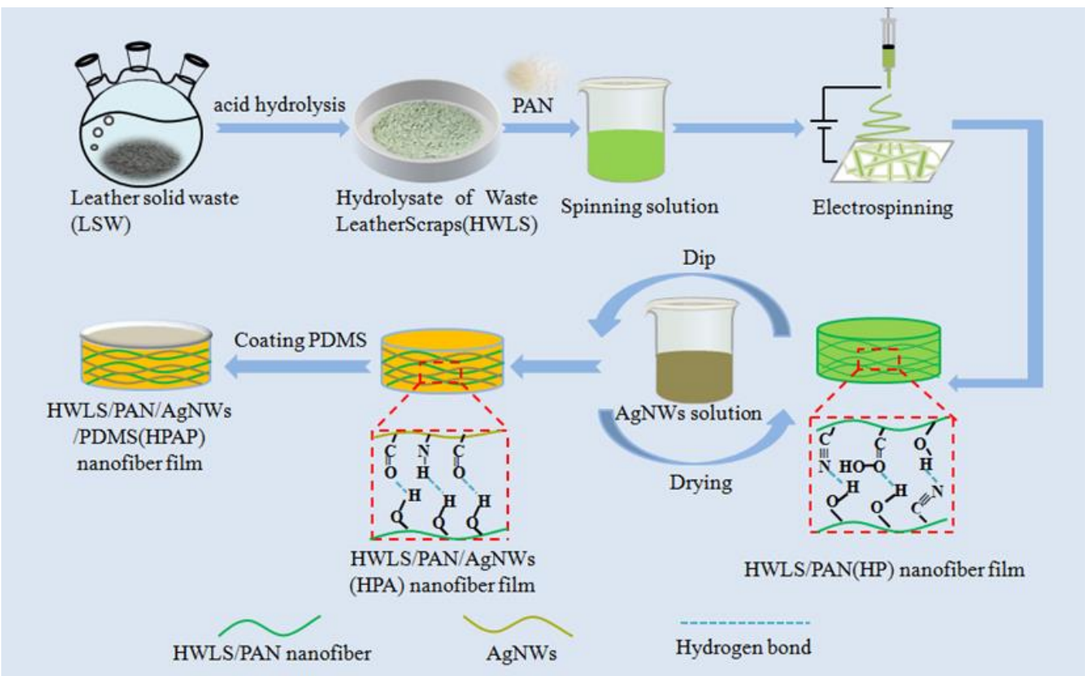
Introduction

A three-step procedure was developed to produce hydrophobic, electromagnetic interference shielding and pressure sensing flexible nanofiber films based on hydrolysate of waste leather scraps (HWLS). The high-performance, environmentally friendly, and low-cost EMI-shielding materials not only displayed promising potential for application in flexible shielding materials or wearable electronic equipment, but also offered a new way toward utilizing leather solid waste in a morevalue-added.

Design Strategy



Results

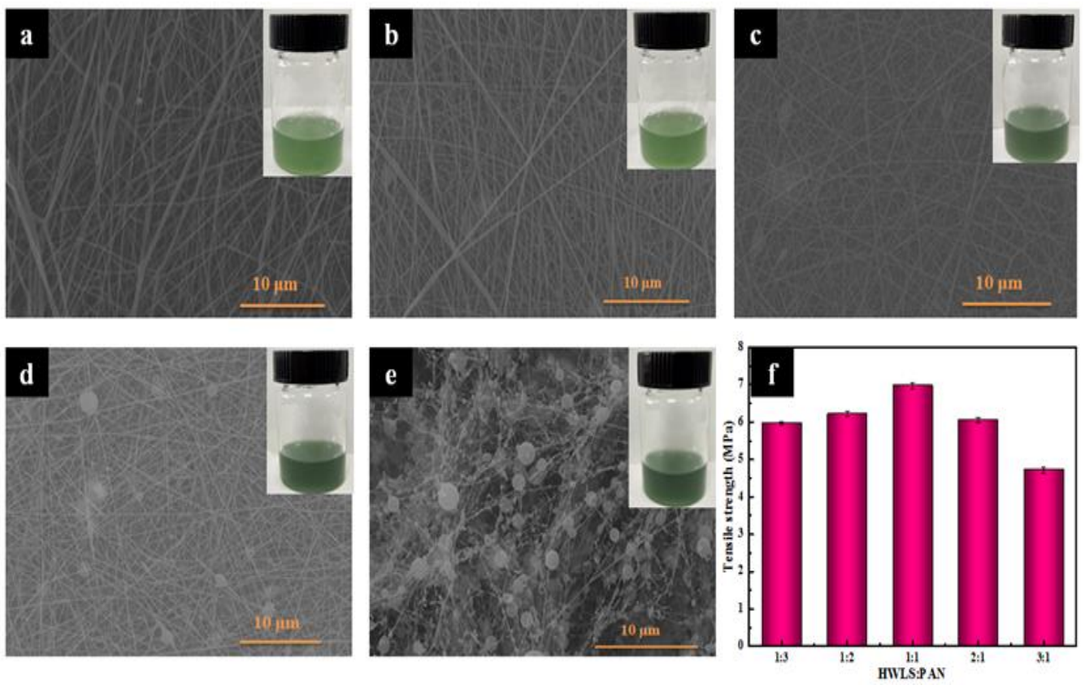


Fig. 1 SEM images exhibiting the different ratios of HWLS and PAN nanofiber films(a)1:3 (b)1:2 (c)1:1 (d)2:1 (e)3:1. (f)tensile strenght of different ratios of HWLS/PAN nanofiber films.

- With the increase of HWLS, the beading phenomenon gradually appears.
- When the ratio of HWLS to PAN is 1:1, the fiber is the uniform, and the film's tensile strenght can reach 6.97 MPa.

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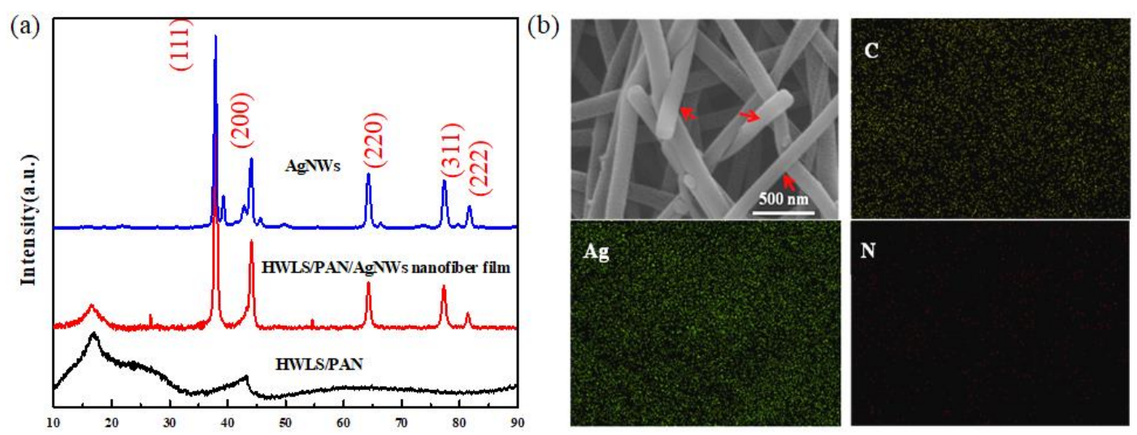

Fig.2 (a) XRD spectra of AgNWs, HP, and HPA nanofiber films, (b) SEM image of HPA nanofiber film, and the corresponding EDS elemental maps of C, Ag, and N.

- The silver nanowire exists in the nanofiber film uniformly, which will cause electromagnetic wave loss.

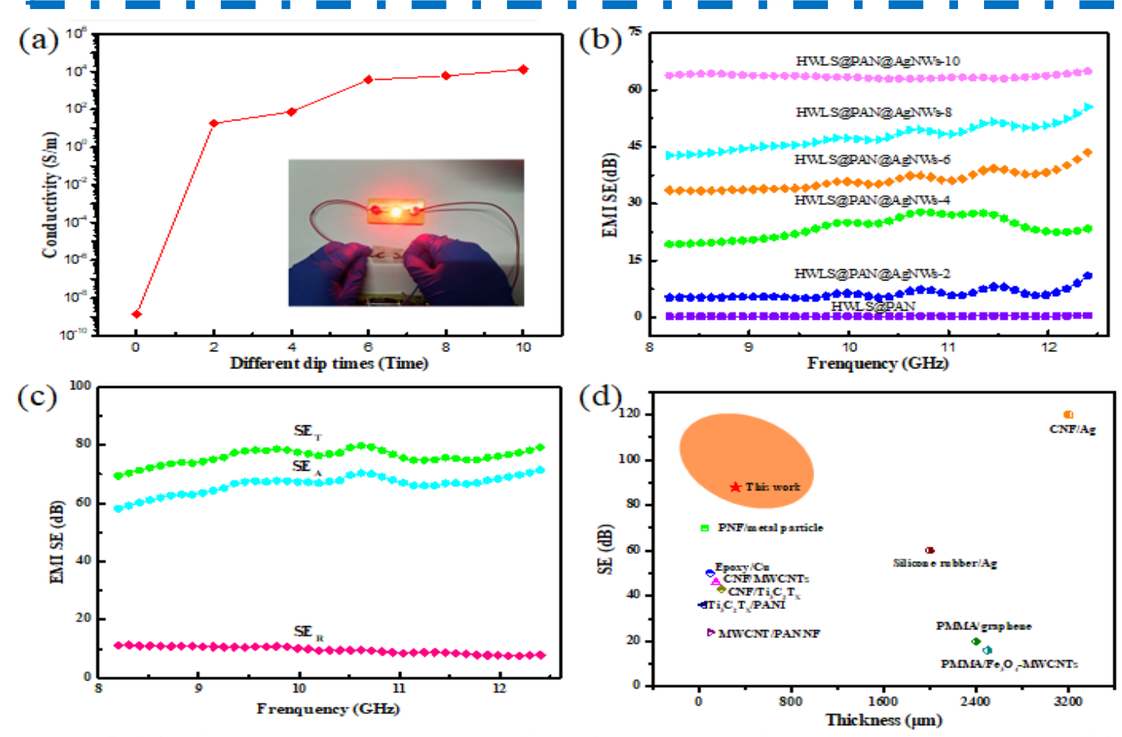

Fig.3 (a) Electrical conductivity of HPA NF-x as a function of dip cycles, (b) EMI performance of HPA-x as a function of dip cycles, (c) SE_R, SE_A and SE_T of the HWLS/PAN/AgNWs/PDMS samples as a function of test frequency, (d) Comparison of EMI-shielding performance vs the thicknessof composite materials in published work

- When the dipping time is 6, bulbs can be lit.
- When the dipping time is 8, the EMI shielding efficiency was 65 dB.
- The HPAP nanofiber film thickness is 320 μm. The EMI SE can reach 70 dB.
- The lower thickness and higher EMI-shielding performance is obtained.

Conclusions

- For HWLS/PAN/AgNWs nanofibers, EMI SE can arrive at 70 dB, conductivity is 10^5 S/m. The film has good stability against corrosive environments and self-cleaning.
- With the increase of HWLS, the beading phenomenon gradually appears.

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