Electronic supplementary information

Electrospinning nanofibrous graft preparation and wound healing studies using ZnO nanoparticles and glucosamine loaded with poly(methyl methacrylate)/polyethylene glycol

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Preparation of Zinc oxide nanoparticles

Zinc oxide nanoparticle was prepared by a hydrothermal approach.[1] Briefly, 0.1 M zinc acetate was added into 50 mL of saturated CTAB aqueous solution under stirring. After 30 min stirring, 0.75 M NaOH aqueous solution was introduced dropwise into the solution under constant stirring for about 1 h, resulting in a white aqueous solution. The mixture was transferred into a Teflon-lined stainless steel autoclave and heated at 150 °C for 24 h. And then, the resulting solid white products were cooled to room temperature and washed several times with distilled water and ethanol to remove the ions present in the final product. Finally, the obtained product was calcined at 300 °C for 3 h.

Characterization of ZnO nanoparticles

FTIR spectra of ZnO nanoparticle is shown in Fig. S1 (A). The broad band observed at 3324 cm^{-1} is due to the physically adsorbed water molecules present in the surface of nanoparticles. The peak at 1632 cm^{-1} is attributed to the C=O stretching of acetate group present in the zinc acetate [Zn $(CH_3COO)_2$] source material. While the characteristic peak observed at 668 cm^{-1} is assigned to the Zn-O interaction in ZnO nanoparticles.

UV-vis absorption spectrum of the synthesized ZnO nanoparticles is shown in Fig. S1 (B). A peak observed at 373 nm is due to the surface plasmon characteristics of ZnO nanoparticles.[2] XRD pattern of ZnO nanoparticles prepared by the hydrothermal process is shown in Fig. S1 (C). Peaks observed at (2θ) = 31.74° (100), 34.39° (002), 36.21° (101), 47.50° (102), 56.55° (110), 62.80° (103), 66.38° (200), 67.88° (112), 69.02° (201), 72.59° (004) 76.94° (202) which are in good agreement with JCPDS card no: 00-036-1451 and can be assigned to the hexagonal wurtzite structure.[3]

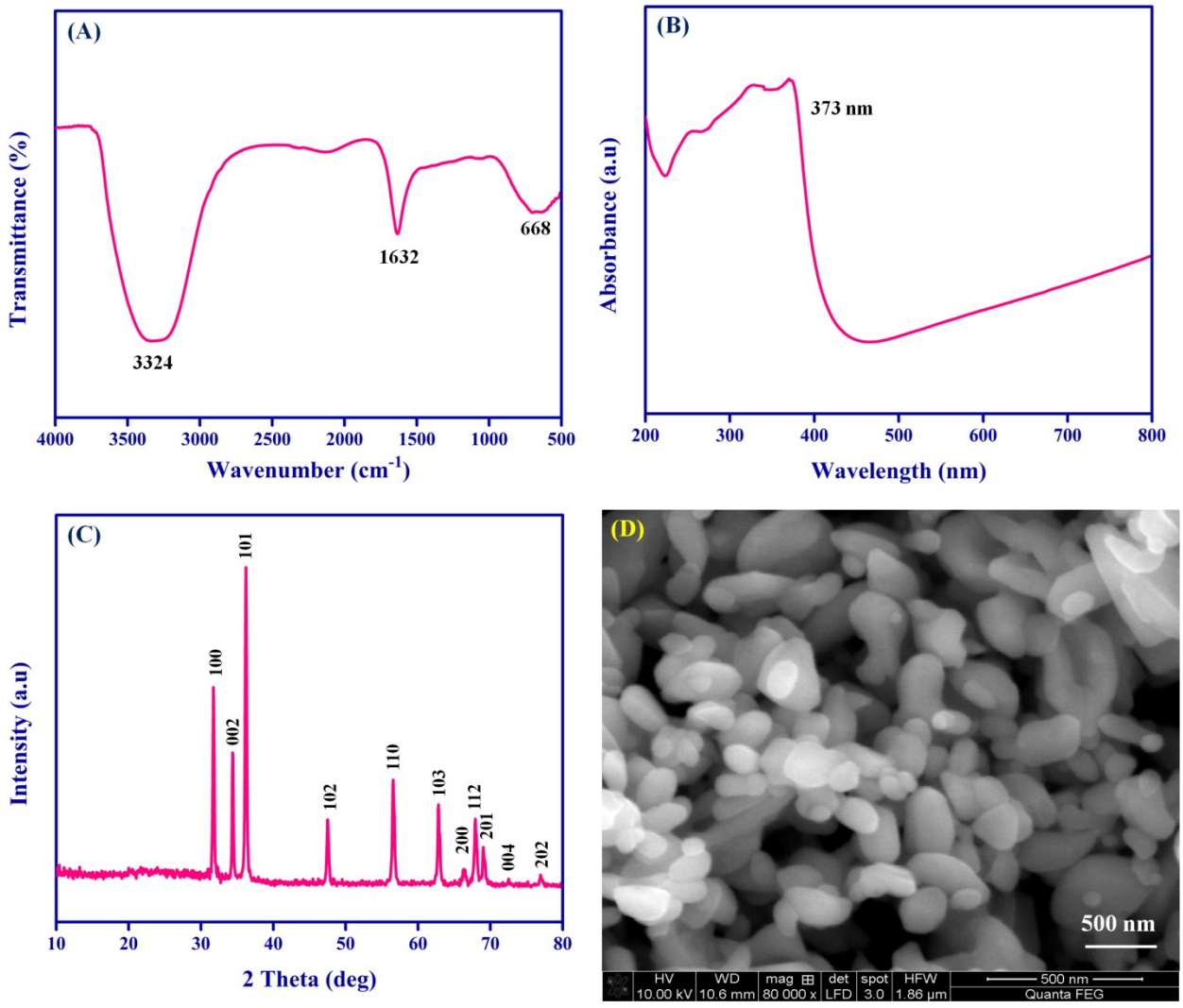

Fig. S1. (A) FTIR spectra (B) UV-vis-NIR absorption spectra (C) XRD pattern (D) SEM images of ZnO nanoparticle.

To investigate the surface morphology of ZnO nanoparticles, SEM images were taken and presented in Fig. S1 (D). The micrographs reveal grains/capsule-like structure with a mean diameter of 110 nm.

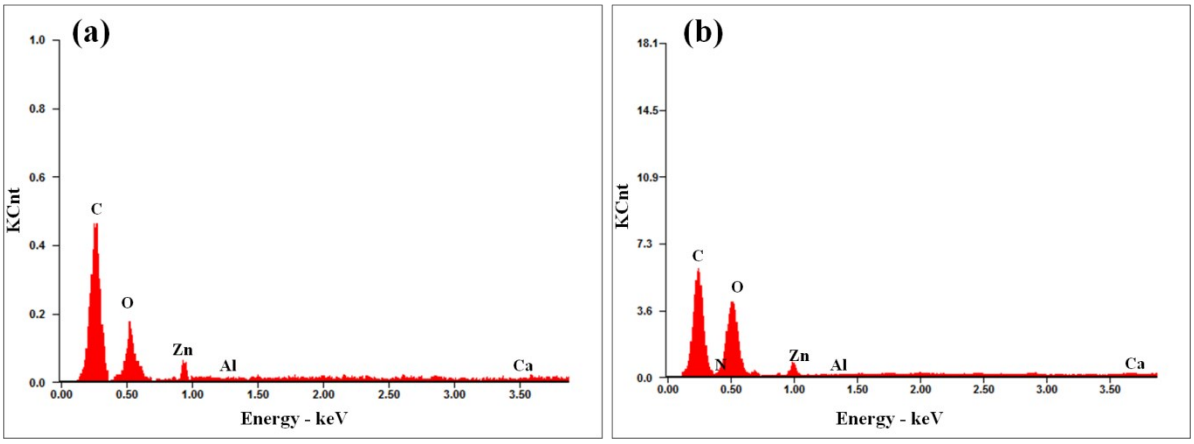

Fig. S2. Energy dispersive X-ray spectroscopy (EDS) images of fabricated nanofibrous grafts: (a) ZnO-PMMA/PEG (b) ZnO-GA/PMMA/PEG nanofibrous grafts.

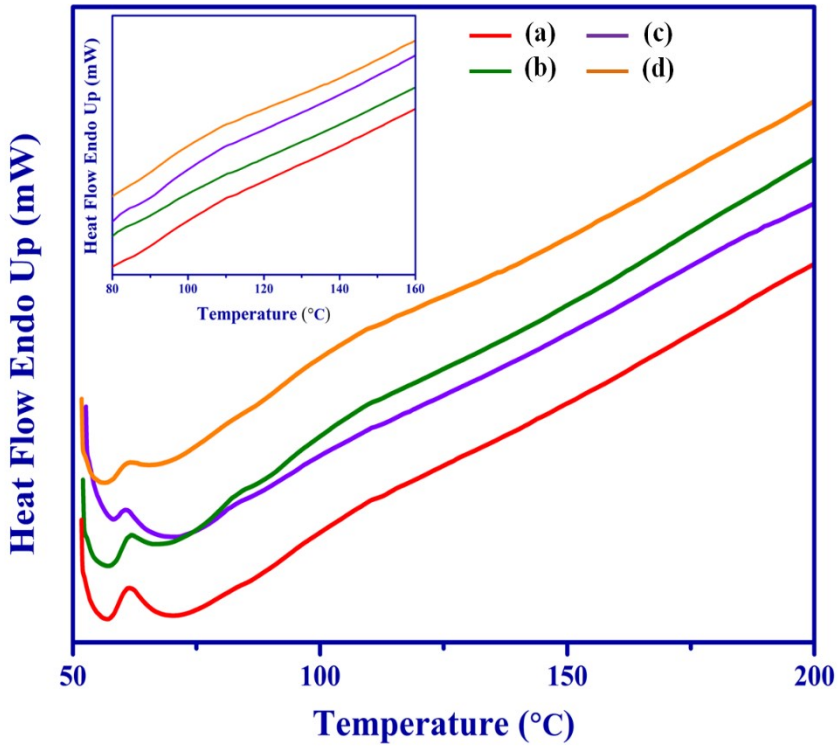

Fig. S3. DSC thermogram of nanofibrous grafts: (a) PMMA/PEG (b) ZnO-PMMA/PEG (c) GA-PMMA/PEG (d) ZnO-GA/PMMA/PEG nanofibrous grafts.

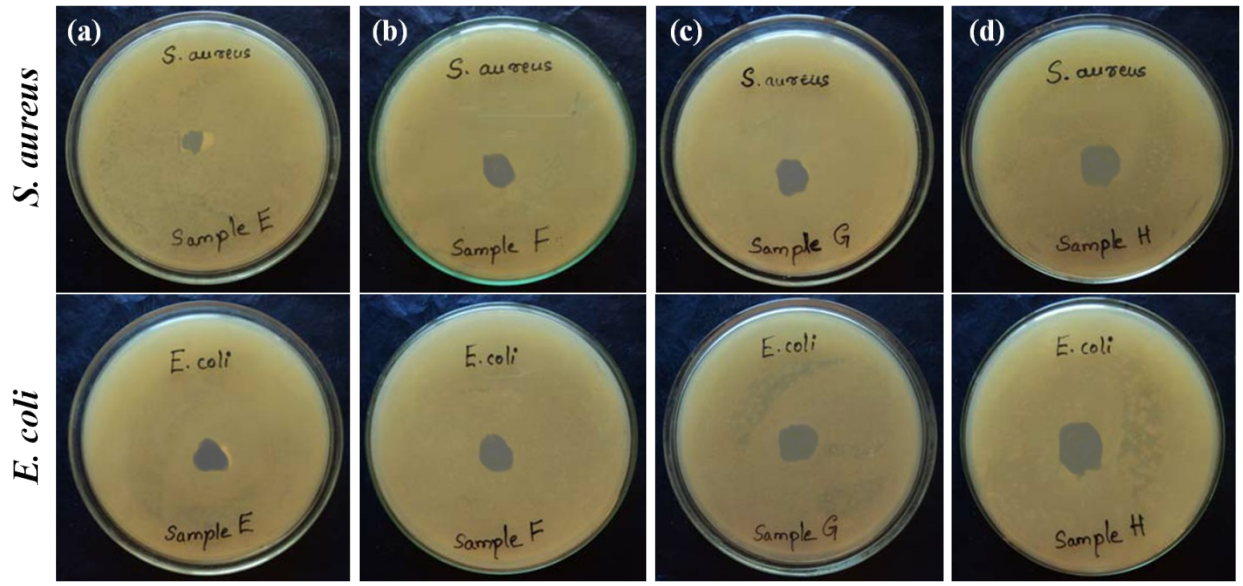

Fig. S4. Antibacterial activity of the nanofibrous grafts by disk diffusion method: (a) PMMA/PEG nanofibrous graft; (b) ZnO-PMMA/PEG nanofibrous graft; (c) GA-PMMA/PEG nanofibrous graft; (d) ZnO-GA/PMMA/PEG nanofibrous graft.

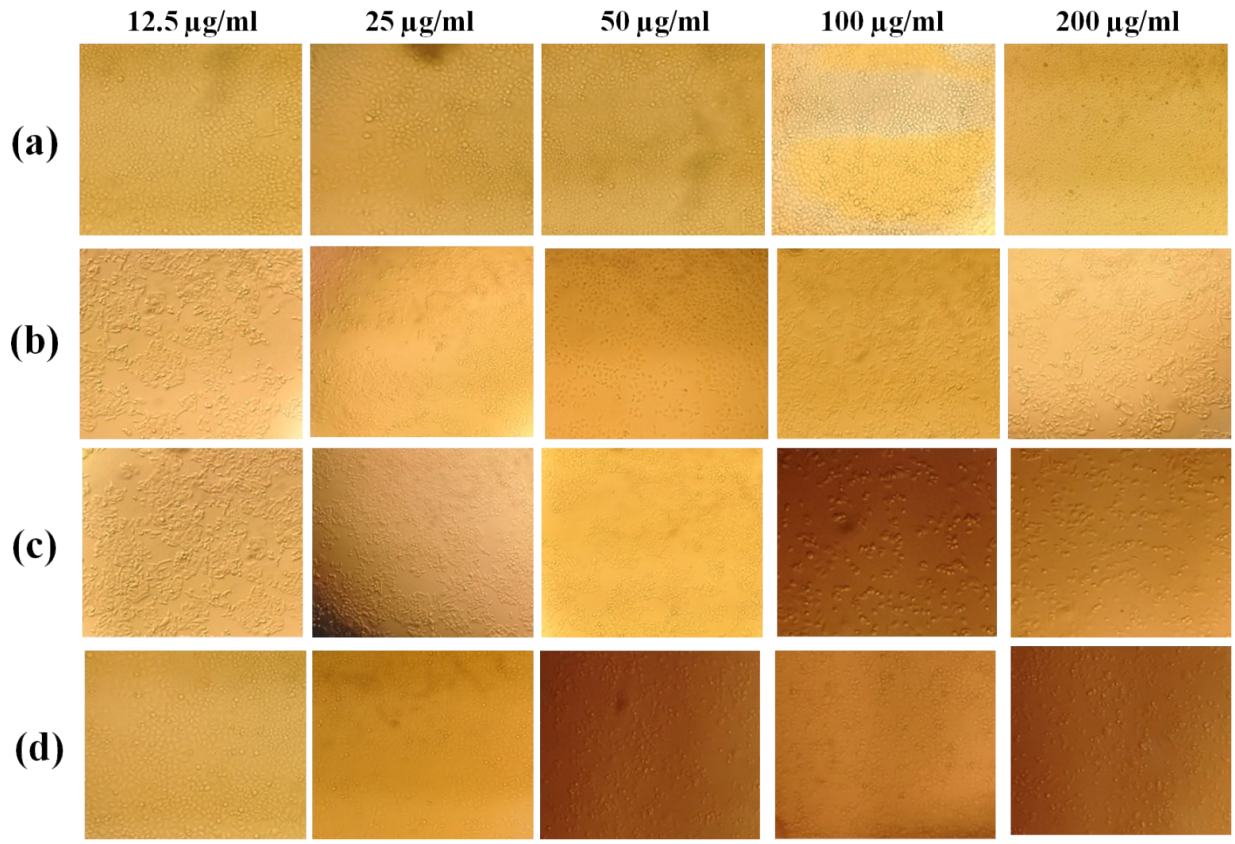

Fig. S5. Photographic images of the MTT assay against L929 fibroblasts: (a) PMMA/PEG nanofibrous graft; (b) ZnO-PMMA/PEG nanofibrous graft; (c) GA-PMMA/PEG nanofibrous graft; (d) ZnO-GA/PMMA/PEG nanofibrous graft.

References

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