**Porous poly(2-hydroxyethyl methacrylate) (PHEMA) hydrogels doped with silver nanoparticles — one-step synthesis, characterisation, antibacterial efficacy and biocompatibility.**

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**Introduction:** 2-Hydroxyethyl methacrylate (HEMA) can be polymerized either thermally (Dziubla *et al.* 2016) or photochemically (Li and Lee, 2005) via free-radical methods to give poly(2-hydroxyethyl methacrylate) (PHEMA). When HEMA is polymerized from aqueous solution, macroporous PHEMA sponges can be obtained (Baker *et al.* 2009).

**Aims**

(a) To synthesize porous PHEMA sponges doped with Ag nanoparticles (Ag NP-PHEMA) in one step. (b) To assess the morphology, biocompatibility and antibacterial activity of Ag NP-PHEMA materials.

**Methods**

A quartz vial was charged with a solution of HEMA, ethylene glycol dimethacrylate, and AgNO3, in water. The vial was sealed (septum) and 2,2-dimethoxy-2-phenylacetophenone (photoinitiator) in ethanol was added. Polymerization of HEMA and reduction of Ag+ was induced by irradiation at 350 nm. Polymer morphology and Ag nanoparticles in the resulting Ag NP-PHEMA materials were characterised by SEM and TEM (Fig. 1). Anti-bacterial properties of Ag NP-PHEMA were assessed by agar disk diffusion experiments.

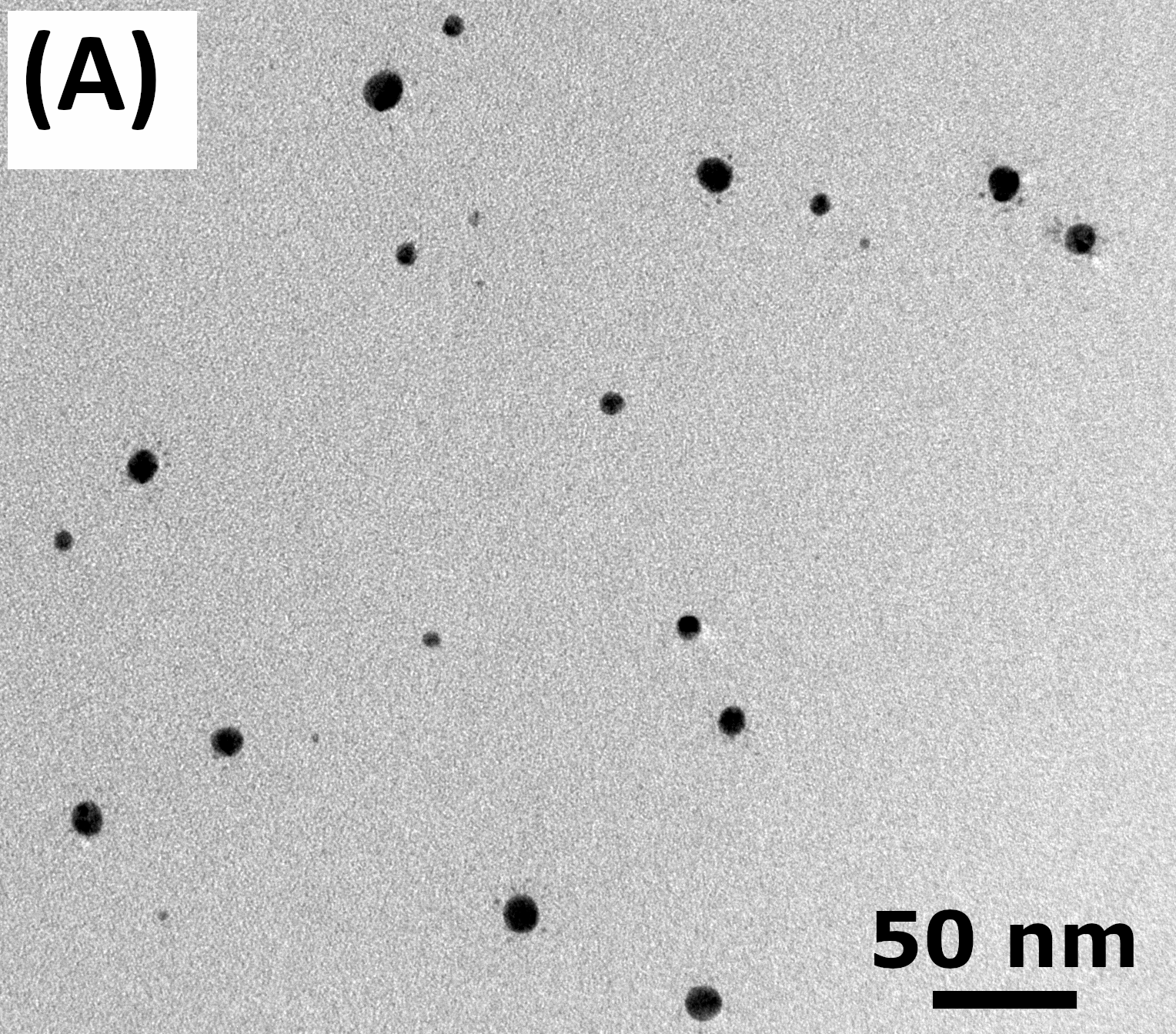
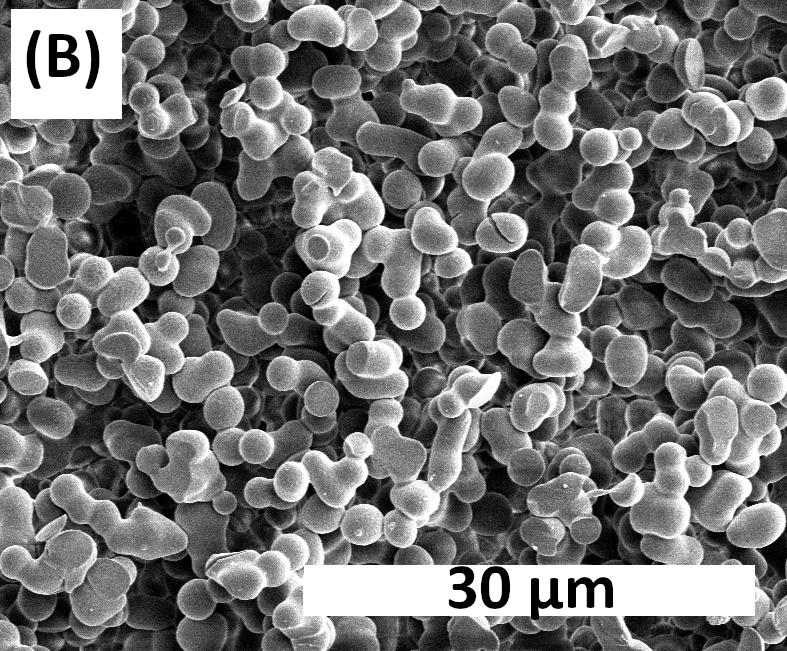
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Fig. 1. (A) Bright field TEM image of Ag NP-PHEMA. (B) SEM image of Ag NP- PHEMA.

**Results**

Ag NP-PHEMA hydrogels exhibited polymer droplet morphology with interconnected pores of dimensions on the micron scale. Ag nanoparticles were spherical in shape with diameters of 2 to 20 nm, and were distributed evenly throughout the polymer matrix. The Ag NP-PHEMA hydrogels were effective against both *E. coli* and *S. aureus* bacteria.

**Conclusion**

Porous, biocompatible Ag NP-PHEMA hydrogels possessing antibacterial properties can be synthesized in a simple one-step process.

**References**

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