P(4-VP) nanoparticles for medical purposes

Ozgur Ozay,1 Aysun Ozturk1, Vahap Yonten2, Nahit Aktas2*, Nurettin Sahiner1

1 Department of Chemistry, Faculty of Science & Art, Canakkale Onsekiz Mart University, Terzioglu Campus 17100, Canakkale, Turkey
2 Department of Chemical Engineering, Faculty of Engineering & Architecture, Yüzüncü Yıl University, 65080 Campus, Van, Turkey
*e-mail: naktas@yyu.edu.tr

P(4-VP) particles are an exceptional starting material in the design of advanced and smart systems for biomedical applications due to their natural novel chemical properties such as amphoteric (acid-base behavior) and amphiphilic (hydrophilic-hydrophobic) characteristics and further modifiable features.

Polymeric 4-VP (p(4-VP)) particles were synthesized in an oil-in-water microemulsion system by varying the amounts of ethylene glycol dimethacrylate (EGDMA) as crosslinker. The prepared p(4-VP) particles were chemically modified to obtain positively charged particles as polyelectrolytes. Furthermore, these p(4-VP) particles were used for in situ Ag and Cu metal nanoparticle syntheses to provide dual action with an additional advantage as bactericidal particles. The synthesized p(4-VP) particles with positive charges and metal constituents were tested for potential antibacterial agents against various bacteria such as Staphylococcus aureus ATCC6538, Pseduomonas aeruginosa ATCC9027, Bacillus subtilis ATCC6633, Escherichia coli ATCC8739. It was found that p(4-VP) particles, especially the positively charged forms had potential as antibacterial materials. The synthesized particle dimensions were characterized with TEM, and DLS measurements. Chemical modification of the particles was confirmed by FT-IR spectroscopy and zeta potential measurements, and the metal nanoparticle contents were determined with thermogravimetric (TGA) studies. Figure 1 shows a TEM image of the synthesized polymer.

Figure 1: TEM images 5 mole % EGDMA crosslinked p(4-VP) particles.