

## Development of polyethylenimine-decorated maghemite/poly( $\epsilon$ -caprolactone) nanoparticles for biomedical applications

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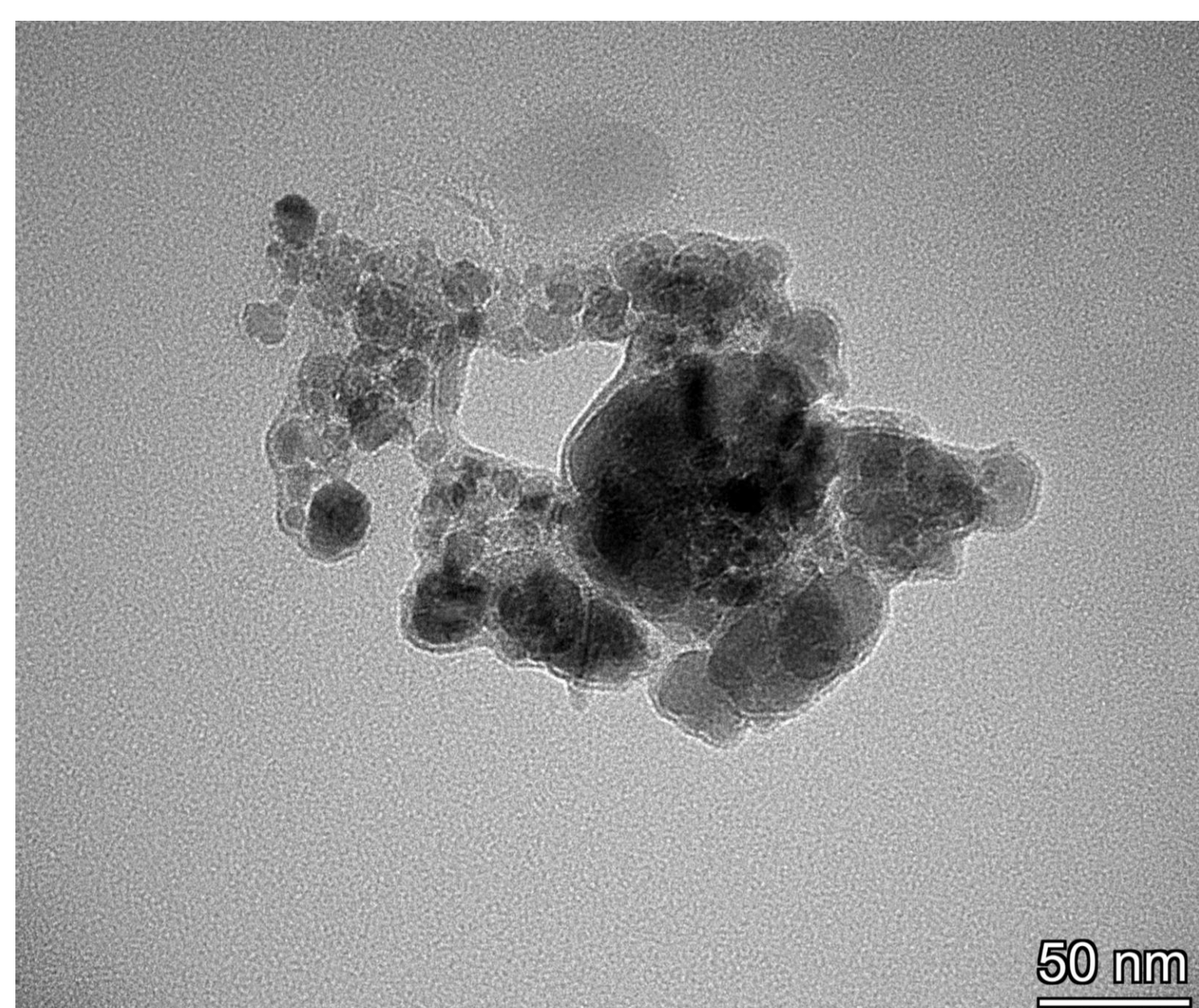
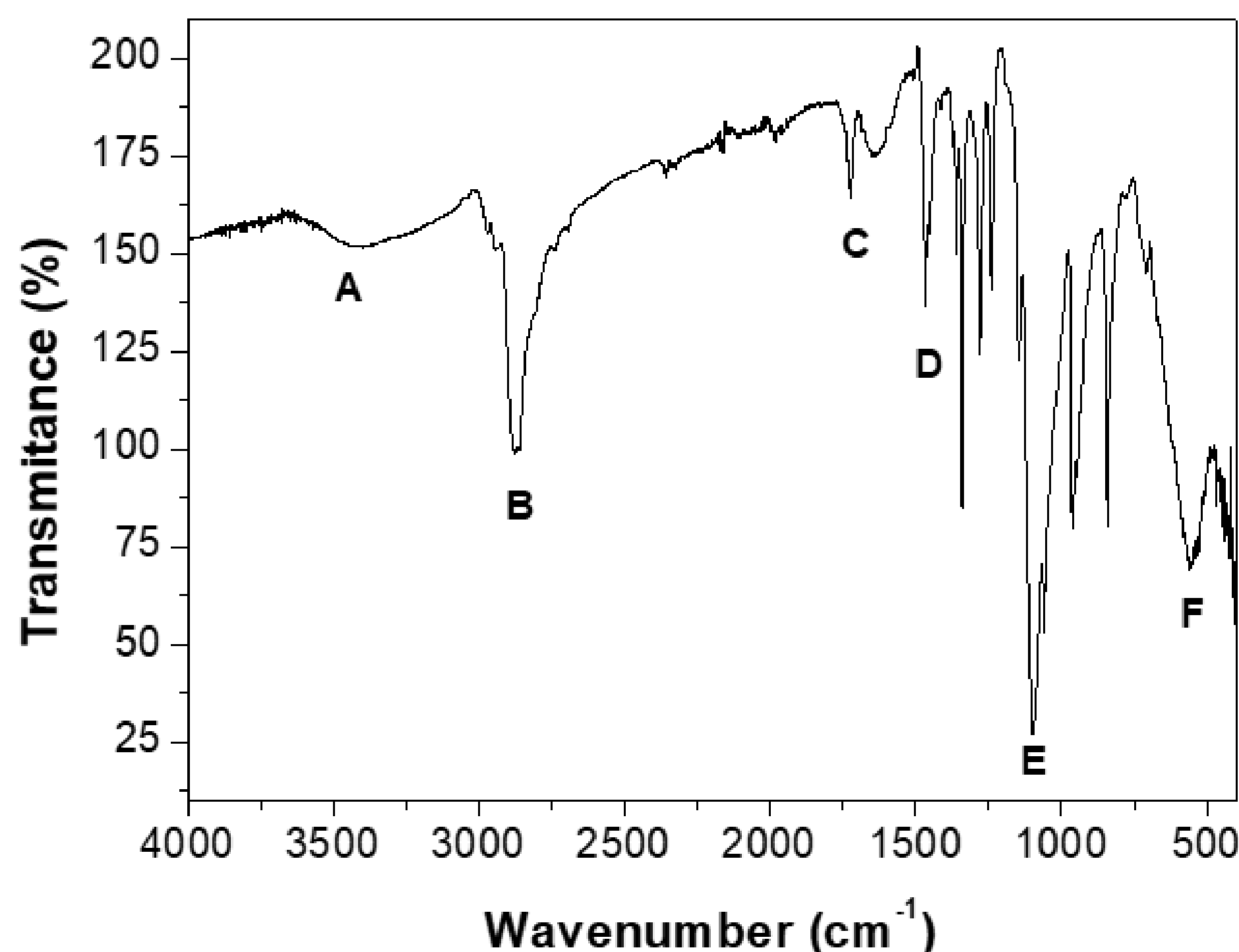
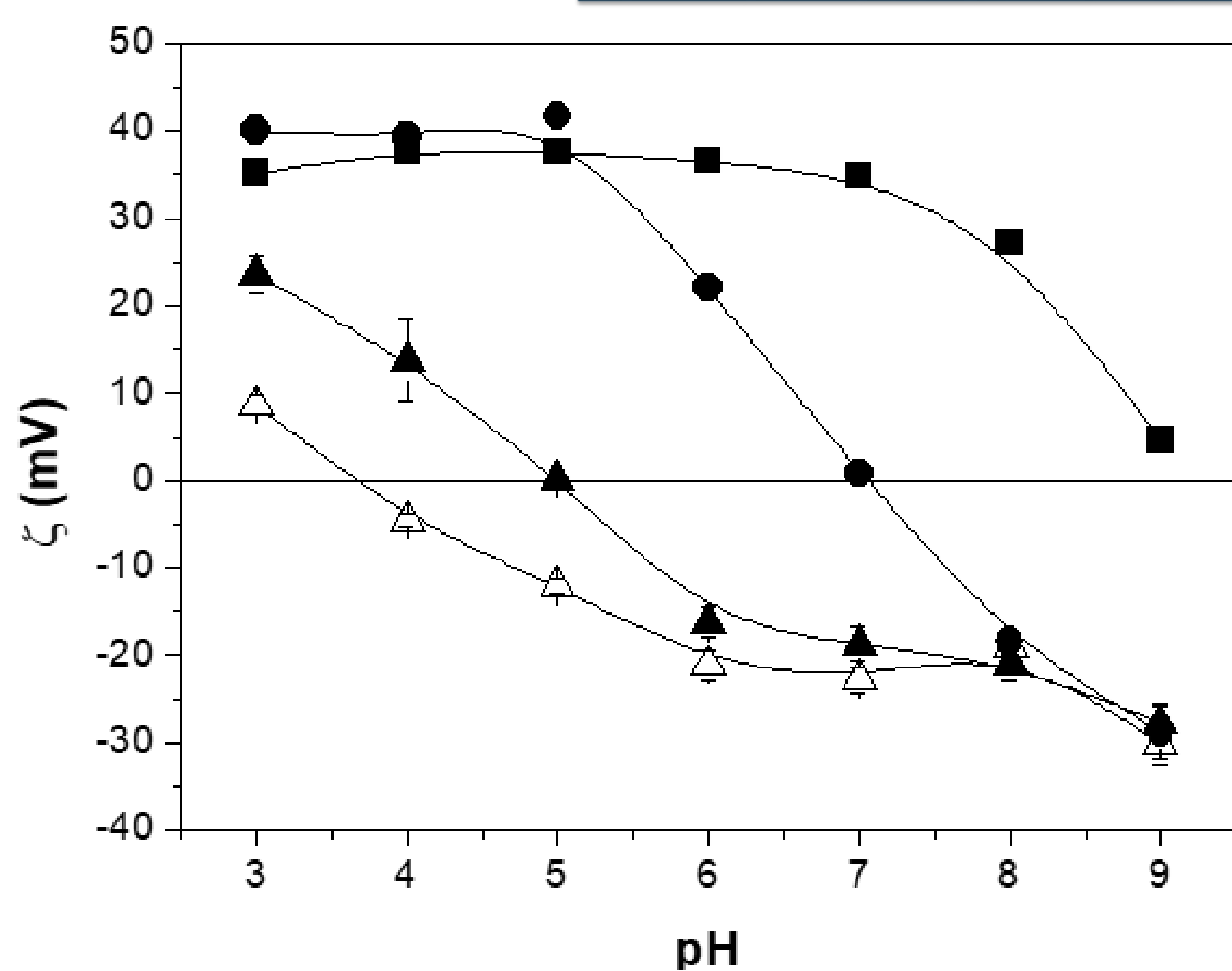
### INTRODUCTION & AIM

Magnetic colloids based on iron oxides, specifically maghemite ( $\gamma$ - $\text{Fe}_2\text{O}_3$ ), have emerged as significant nanostructures in biomedicine due to their superparamagnetic properties, which enable targeted therapies, magnetic hyperthermia, and photothermia, as well as functionalities as contrast agents in magnetic resonance imaging. In this context, magnetopolymeric NPs based on  $\gamma$ - $\text{Fe}_2\text{O}_3$  nuclei embedded into a poly( $\epsilon$ -caprolactone) (PCL) matrix and decorated with polyethylenimine (PEI) were developed and evaluated.

### METHOD

Preparation of the magnetic nanocomposites ( $n = 3$ ) was carried out by **solvent evaporation**. Iron oxide nuclei were obtained by **chemical co-precipitation** and were surface functionalized with PCL first and then with PEI. Reproducible preparation of these nanohybrids was demonstrated by determining particle size using photon correlation spectroscopy, high-resolution transmission electron microscopy (HRTEM), Fourier-transform infrared spectroscopy (FTIR), and **electrophoresis** (defining the effect of pH on the surface electrical charge of the colloid).

### RESULTS & DISCUSSION



The **PEI-decorated ( $\gamma$ - $\text{Fe}_2\text{O}_3$ /PCL)** (core/shell) nanohybrids were characterized by an average size of  $232.9 \pm 3.3$  nm (polydispersity index:  $0.259 \pm 0.001$ ). The evolution of the zeta potential values of the nanohybrids as a function of pH confirmed the successful embedding of the iron oxide cores, first into the PCL matrix, and then the surface decoration of the core/shell particles by a PEI ring. Finally, HRTEM analysis and FTIR spectra confirmed the successful formation of the (core/shell)/shell nanostructure.

### CONCLUSION

A **reproducible methodology** has been proposed for preparing **PEI-decorated  $\gamma$ - $\text{Fe}_2\text{O}_3$ /PCL NPs**, which hold promise for **applications in biomedicine**.

### FUTURE WORK / REFERENCES

- [1] Garcia-Garcia G, Fernández-Álvarez F, Cabeza L, Delgado Á V., Melguizo C, Prados J, et al. *Polymers*. 2020;12(2790).
- [2] Megías R, Arco M, Ciriza J, Saenz del Burgo L, Puras G, López-Viota M, et al. *Int J Pharm*. 2017;518(1-2):270-80.