Zinc oxide nanoparticles loaded on polymers for biomedical applications

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Zinc oxide (ZnO), due to its unique optical, electrical, and magnetic properties, has drawn increasing interest across diverse sectors, including cosmetics, food, and medicine. As a semiconductor, ZnO is responsive to light, particularly in the UV spectrum, which has spurred innovative developments. Upon light activation, ZnO can generate reactive oxygen species (ROS), which can damage the DNA of cancer cells. [1]
In this work, ZnO has been studied for its UV-based biomedical applications and its photocatalytic properties which can be characterized as an antibacterial and anticancer agent, particularly in phototherapy. In detail, the sized dependency of the particles were studied by changing many factors in the synthetic process such as calcination temperature, base concentration, precursor and precursor concentration. It was observed that the milder conditions produced smaller particles. The photocatalytic properties were measured by the degradation of Rhodamine B while the smaller particles were shown best performance. [2]
From a pharmaceutical perspective, nanotechnology-based drug delivery systems are essential for enhancing the pharmacodynamic and pharmacokinetic properties of therapeutic agents. This study focuses on the synthesis and stability of ZnO nanoparticles coated with different polymers. [3] For this reason, the ZnO nanoparticles were coated with branched and linear polyethylenimine and poly[(2-dimethylamino)ethyl methacrylate)], the latter synthesized through Reversible Addition–Fragmentation Chain Transfer (RAFT) polymerization. The objective was to investigate the stability of these nanoparticles and explore their potential for improved bioavailability, reduced toxicity, and targeted, controlled drug release. [4]

References

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Figures

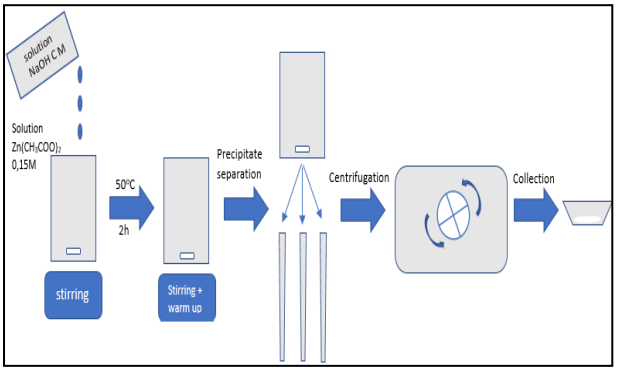

Figure 1: Schematic representation of experimental process of ZnO synthesis

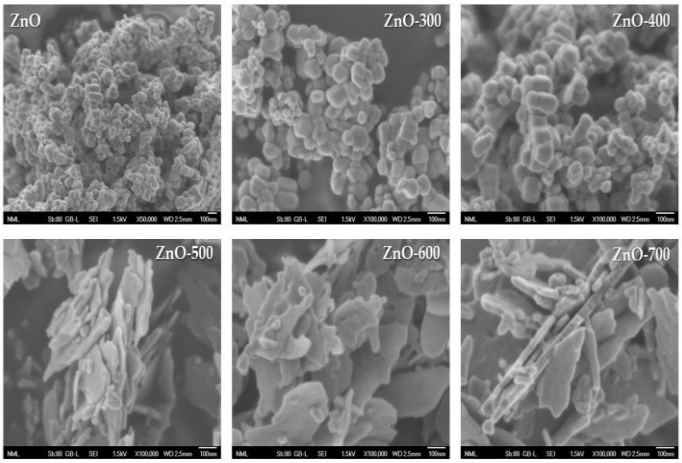

Figure 2: Representative FESEM images of ZnO samples.