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A STUDY OF PROPERTIES AND STRUCTURE OF SILVER NANOPARTICLES

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ABSTRACT

Silver nanoparticles (AgNPs) have garnered significant attention due to their unique properties and diverse applications. These nanoparticles are typically defined as particles of silver with a size range between 1 to 100 nanometers. Their small size results in a high surface-area-to-volume ratio, which enhances their chemical reactivity, optical properties, and catalytic activity. Structurally, silver nanoparticles can be synthesized in various shapes, including spherical, rod-shaped, and cubic, depending on the method of preparation. The crystalline structure of AgNPs is generally face-centered cubic (FCC), which contributes to their stability and mechanical strength. One of the key properties of silver nanoparticles is their strong antimicrobial activity, making them highly effective against bacteria, viruses, and fungi. This property arises from their ability to release silver ions (Ag+), which interact with microbial cell membranes and DNA, leading to cell death. Additionally, AgNPs exhibit unique optical properties, such as localized surface plasmon resonance (LSPR), which makes them useful in biosensing and imaging applications. The electrical conductivity and thermal stability of silver nanoparticles also make them valuable in electronic devices and conductive inks. Overall, the versatile properties and structure of silver nanoparticles enable their widespread use in medicine, electronics, and environmental applications.