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Optoelectronic and antibacterial studies of hydrothermally grown microcrystalline ZnO, as-received and after interactions with s. aureus bacteria DUSTIN JOHNSON, JACOB TZOKA, JOHN REEKS, IMAN ALI, SHAUNA MCGILLIVRAY, YURI STRZHEMECHNY, Texas Christian University — The most fundamental mechanisms driving antibacterial action of ZnO are still being vigorously debated. Among those – the influence of the ZnO crystal surfaces and morphology, especially in due to the nature of the charged polar and uncharged nonpolar surfaces of the anisotropic wurtzite ZnO crystal lattice. To address this, we developed a hydrothermal method to grow microscale ZnO crystals with tunable morphologies ranging from predominantly polar to predominantly nonpolar surfaces. The size of the grown crystals prevents them from being internalized by the s. aureus cells, which have a diameter of ca. 500 nm. Using this platform, we investigated the impact of morphology and surface polarity on the interactions between ZnO and bacteria. SEM and EDX studies confirmed the quality and morphology of our samples before interactions with bacteria. SEM and EDX were also employed to analyze changes due to interactions with s. aureus. Photoluminescence and surface photovoltage studies were used to characterize the electronic structure and the near-surface charge dynamics in our samples. Optoelectronic investigations were performed before and after interactions with bacteria. Comparative studies revealed that the antibacterial action of ZnO microparticles is primarily rooted in the interactions between the ZnO surfaces and the extracellular material. We also confirm that growth media and environment have a substantial impact on these interactions.

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