High Concentration Silver-Carrying Materials With Controlled Silver Dissolution and Efficiently Long-Acting Sterilization

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Silver ion antibacterial materials are safe, have low toxicity and high efficiency; Phosphate glasses are environmentally friendly, stable, adjustable and water-soluble. By introducing antibacterial silver ions and other chemical components into the structure of phosphate glasses, silver-carrying phosphorous glasses can be obtained as antibacterial materials. However, the preparation of silver-carrying phosphate glasses, especially high concentration silver-carrying materials is a tough task, because of the solubility limitation of silver ion in glass melts and the very easy reduction of silver ions to metallic silver atoms in glass. Thus, determining new silver containing phosphate glass with high silver concentrations and studying their antibacterial properties are highly attractive topics. By modifying the composition of different component contents and preparation process, we obtained high concentration silver-carrying phosphate glasses with clear, transparent and homogenous glass state. Using various characterization methods, the structure of these novel materials has been analyzed in detail. Their sustained-release and silver ion dissolution properties were tested, and the corresponding germicidal ability was investigated. The relationship among the chemical composition, silver ion sustained-release and bactericidal performance has been discussed. Excellent silver-doped phosphate glasses were screened, which can release silver ion quickly and steadily at room temperature. The sterilization rate up to 100.00% for both E. coli and S. aureus. Silver-doped phosphate glasses as efficient and environment-friendly antibacterial materials have great significance and potential applications in many fields.

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