杀菌功能载银活性炭的$NaBH_4$还原法制备及其表征

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中文关键词 $NaBH_4$还原 载银活性炭 载银量 抗菌 缓释

英文关键词 $NaBH_4$ reduction method activated carbon-silver composite silver content antibacterial control release

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中文摘要

通过$NaBH_4$还原法制备了银缓释杀菌功能载银活性炭(Ag/AC)，研究了其对大肠杆菌(*E.coil*)的杀灭性能和抗银流失性能.以低温液氮吸附测定活性炭的比表面积，以扫描电子显微镜(SEM)-X射线能谱仪(EDS)分析Ag/AC表面形态以及Ag的含量和分布，以X射线衍射(XRD)观察Ag/AC晶体结构.结果表明，银以单质形式负载在活性炭上.活性炭的载银量、比表面积、银颗粒的粒径及分布取决于$AgNO_3$溶液浓度.在不同$AgNO_3$溶液浓度条件下，银的晶核形成和生长机制发生改变.随着$AgNO_3$溶液浓度的增加，所制备Ag/AC表现出由无活性、抑菌到杀菌活性的变化规律.载银量为2.70%(质量分数）时，Ag/AC能在90 min内杀灭2×10^6 CFU/mL浓度的大肠杆菌，且在水中振荡600 h的银流失量为21.1%.在保持较高杀菌活性前提下，可以实现银的缓释.

英文摘要

Activated carbon-silver composite(Ag/AC) for antibacterial behavior with capability of controlling silver release was prepared by $NaBH_4$ reduction method. The antibacterial activity towards *E.coil* and resistance of water erosion was investigated through a point of view of water purification. N_2 adsorption isotherm, Scanning electron spectroscopy(SEM)-Energy dispersive X-ray spectrometer(EDS) and X-ray diffraction(XRD) was used to characterize the surface morphology and pore properties. As an experiment result, silver was deposited on AC in the state of Ag^0. The content of silver supported, specific surface area, nucleus formation and growth mechanism, particle size and distribution of the generated silver particles were determined by the concentration of the aqueous solution of $AgNO_3$. With the increasing of $AgNO_3$ solution concentration, the activity of the obtained Ag/AC changed from non-active to inhibitory and then to high antibacterial. Ag/AC supported silver content of 2.70% killed all the concentration of 2×10^6 CFU/mL of *E.coil*. However, it showed high resistance to water erosion that silver loss was 21.1% in 600 h for surging. High antibacterial activity and control silver release can be simultaneously realized by the $NaBH_4$ reduction method.