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能源和环境工程

氧化电解水杀菌特性及其对肉品杀菌作用

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摘要 利用自制三室型电解槽制备酸性氧化电位水(EOW)，并对自制的钽铱氧化物电极进行了XRD、SEM和电化学分析。以枯草杆菌黑色变种芽孢（ATCC9372）为杀灭对象，考察影响EOW杀菌作用的三个特性因素，即有效氯(ACC)、氧化还原电位(ORP)和pH值。结果表明，利用自制三室型电解槽制备氧化电解水(EOW)，对自制铱氧化物电极进行了XRD、SEM表征和电化学分析。以枯草杆菌黑色变种芽孢（ATCC9372）为杀灭对象，考察了影响EOW杀菌作用的3个因素，即有效氯(ACC)、氧化还原电位(ORP)和pH值。结果表明，ACC值越高，EOW的杀菌效率越高，当ACC值大于40 mg.L^{-1}时，杀菌效率进一步提高缓慢，最大杀菌率为99.89%，杀灭对数值为2.67lgcfu.ml^{-1}。EOW中有效氯存在形式以HClO为主，这也是EOW具有高效杀菌作用的原因。随ORP值增加，杀菌效率也随之增加，但当其大于1100 mV后，杀菌率和杀灭对数值进一步增加较少，可分别达到99.99%和3.86lgcfu.ml^{-1}。pH值本身对杀菌效率影响很小，但pH值改变会影响有效氯的存在形式。考察了EOW对肉品的杀菌效果，结果表明当EOW与肉品接触后，其ACC值、ORP值会迅速下降，1 min后分别由78.60 mg.L^{-1}和1132mV降低到47.35 mg.L^{-1}和935 mV;25 min后降低至11 mg.L^{-1}和815 mV，此时EOW已失去高效杀菌能力。EOW对肉品杀菌20 min后，杀菌率为99.96%，杀灭对数值为3.42lgcfu.g^{-1}。

关键词

氧化电解水 有效氯 氧化还原电位 pH值 肉品

分类号

Sterilization characteristics of electrolyzed-oxidizing water and its sterilizing effect for meat

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Abstract

An electrolytic cell with three segments was used to make electrolyzed oxidizing water (EOW), and the IrO_2 electrode was characterized by XRD, SEM and electrochemical analysis.Three impact factors for the sterilization, *i.e.*the available chlorine content (ACC), the redox potential (ORP) and the pH value, were investigated in killing Bacillus subtilis varniger (ATCC9372).It was found that the higher the ACC value, the higher the sterilizing efficiency.When the ACC value in EOW is higher than 40 mg.L^{-1},the sterilizing efficiency improves slowly, where the maximum sterilization ratio is 99.89% with a killing logarithm value of 2.67 lgcfu.ml^{-1}.The ACC existence form in EOW is mainly HClO, which is the reason for the high sterilizing efficiency.With the increase of the ORP value, the sterilizing efficiency also increases.While, when the ORP value is higher than 1100 mV, the increase in sterilization ratio and the killing logarithm value get slow, the maximum of which reaches to 99.99% and 3.86 lgcfu.ml^{-1}, respectively.The pH value almost has no effect on the sterilizing efficiency, while the change in pH value can influence the ACC existence form.The sterilizing effect of EOW for meat was also investigated.When the meat is contacted with EOW, the ACC and ORP values decrease rapidly.After 1 min, the ACC and ORP values change from 78.60 mg.L^{-1} and 1132mV to 47.35 mg.L^{-1} and 935mV, respectively.After 25 min, the EOW has no high sterilizing effect any more.The killing ratio and the killing logarithm values of the EOW for meat in 20 min are 99.96% and 3.42 lgcfu.g^{-1}, respectively.

Key words

electrolyzed oxidizing water available chlorine content redox potential pH value meat

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