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Full Paper

利用发光细菌及PbO_2电化学传感器对氰化物和毒鼠强污染的毒性评估

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摘要 本文利用发光细菌及PbO_2电化学传感器对KCN及毒鼠强污染的毒性进行了评估。青海弧菌是发光细菌的一种，在正常条件下能够发出可见光，在毒性物质存在下细菌的活性受到抑制，其发光强度相应地发生降低，因此可以用来对毒性物质如KCN和毒鼠强进行毒性评估。KCN和毒鼠强的毒性测定结果以细菌与毒物作用10min后发光强度被抑制50%所需的毒性物质浓度，即10min-EC50来表示。同时，本文还研制了一种纳米PbO_2修饰电极，该修饰电极上的电流响应与大肠杆菌的数目呈良好的线性关系。由于电流响应随着毒性物质的加入而降低，因此也可以用来进行毒性评估。本文对上述两种方法毒性评估的机理进行了初步的探讨，并根据实验结果进行了比较。纳米PbO_2修饰电极具有高的灵敏度、低的检出限以及操作简便等优点，因此在食品、环境以及安全保障等方面都具有广阔的应用前景。

关键词 毒性评估, 发光细菌, PbO_2电化学传感器

分类号

Toxicity Assessment of Cyanide and Tetramethylene Disulfotetramine (Tetramine) Using Luminescent Bacteria *Vibrio-qinghaiensis* and PbO_2 Electrochemical Sensor

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Abstract The toxicities of cyanide and tetramethylene disulfotetramine (tetramine) were evaluated by two methods of luminescent bacteria and PbO_2 electrochemical sensor. *Vibrio-qinghaiensis*, a kind of luminescent bacteria, can produce bioluminescence and the bioluminescence was decreased with the addition of toxicants. The toxicities of cyanide and tetramine were expressed as 10 min-EC_{50} value, which was the concentration of chemical that reduces the light output by 50% after contact for 10 min. Nano PbO_2 modified electrode, a rapid toxicity determination method was also described in this work. By the PbO_2 modified electrode, the current responses of *Escherichia coli* (*E. coli*) were changed with the addition of toxicants. The value of 10 min-EC50 was also provided with the PbO_2 electrochemical sensor. Compared with the 10 min-EC50 and detection limits (38.38 and 0.60 μg/mL for cyanide, 0.24 and 0.02 μg/mL for tetramine) with luminescent bacteria, the PbO_2 sensor provided a simple and convenient method with lower 10 min-EC50 and detection limits (26.37 and 0.52 μg/mL for cyanide, 0.21 and 0.01 μg/mL for tetramine) and fast response time.

Key words toxicity evaluation bioluminescent bacteria PbO_2 electrochemical sensor

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