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60Co-g辐照改性银掺杂纳米TiO2及光催化降解乙烯

Photocatalysis degradation of ethylene with γ-ray irradiated modified silver-doped TiO2

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中文关键词：辐照,光催化,乙烯,60Co-g射线,二氧化钛,银,纳米粒子

英文关键词:radiation photocatalysis ethylene 60Co-γ ray titanium dioxide silver nanoparticles

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中文摘要:

为了解60Co-g射线辐照且以活性炭纤维（ACF）为载体所负载TiO2的半导体材料（TiO2/ACF）对光催化降解冷藏环境中乙烯的影响，该文拟采用60Co-g辐照制备纳米Ag沉积的TiO2/ACF（Ag-TiO2/ACF）光催化材料，在模拟园艺产品的冷藏环境中，进行了3种不同膜的光催化降解乙烯效果的研究，并利用场发射扫描电镜（FESEM）、透射电子显微镜（TEM）、X射线衍射仪（XRD）对所制备的光催化材料进行相关的表征分析。结果表明：在加入分散剂聚乙烯吡咯烷酮后，60Co-g辐照能使Ag颗粒较好地负载在TiO2上，TiO2均匀分散在ACF膜上而不发生团聚，且TiO2颗粒晶相改变、尺寸变小，有助于提高Ag-TiO2/ACF的催化效率。Ag-TiO2/ACF光催化降解乙烯的效果用一级动力学速率方程描述；经辐照制备的Ag-TiO2/ACF薄膜比未辐照的TiO2/ACF和辐照的TiO2/ACF薄膜光催化降解乙烯的反应速率常数分别提高了44%和37%。研究结果为TiO2光催化技术的进一步的应用提供了参考。

英文摘要:

In order to investigate the effect of TiO2 irradiated by 60Co-γ ray and loaded by activated carbon fibers on photocatalytic degradation of ethylene in the environment of cold storage, the TiO2/ACF photocatalytic materials deposited with nano-Ag (Ag-TiO2/ACF) irradiated by 60Co-γ ray were prepared, and effects of three different films on the photocatalytic degradation rate of ethylene were investigated in the simulated cold storage environment for horticultural products. Environmental Scanning Electron Microscope (ESEM)、Field Scanning Electron Microscope (FESEM) and X-ray diffractometer (XRD) were used to analyze the characterizations of the prepared Ag-TiO2/ACF. Results showed that: 60Co-γ ray could make Ag load on the surface of TiO2 well and TiO2 could be dispersed on the ACF uniformly after adding the dispersant of polyethylene pyrrolidone, which could effectively prevent the aggregation of the nano-particles. The average particle size of TiO2 became smaller, which could increase the efficiency of photocatalytic degradation of Ag-TiO2/ACF. The apparent rate constant of photocatalytic degradation reaction of Ag-TiO2/ACF film irradiated by 60Co-γ ray increased by 44% and 37% respectively compared to unirradiated TiO2/ACF film and irradiated TiO2/ACF film. The research can provide a basis for the application of TiO2 photocatalytic technology to degrade ethylene in fruit and vegetable cold storage.

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