國立屏東教育大學102學年度研究所碩士班入學考試

科學文獻判讀 試題

（化學生物系碩士班）

※請注意：1.本試題共二頁。
2.答案須寫在答案卷上，否則不予計分。

問答題（共 100 分）

一、（25%）

Preparation, characterization and antibacterial properties of silver-modified graphene oxide

Jizhen Ma, Jintao Zhang, Zhigang Xiong, Yu Yong and X. S. Zhao
J. Mater. Chem., 2011, 21, 3350

Silver (Ag) has been known as an antibacterial agent for centuries.[1] Apart from releasing Ag ions that can inactivate the microorganism cells by destroying the cell membrane and DNA replication ability,[2,3] Ag nanoparticles themself can directly cause bacterial cell membrane damage,[4,5] leading to an increased permeability, and eventually result in cell death. Most commercially available Ag nanoparticles have limited control over the size, morphology and degree of aggregation[6,7] which are important parameters for determining the antibacterial activity of Ag nanoparticles.

In this work, we modified the GO by depositing Ag nanoparticle on the surface of GO nanosheets, which promised two advantages: (a) to keep Ag nanoparticles well-dispersed in aqueous solution with the support of GO, and (b) to enhance the antibacterial activity by the synergistic effect of Ag nanoparticles and GO. Experimental results showed that the Ag–GO nanosheets displayed excellent antibacterial properties towards E. coli. An antibacterial mechanism was proposed to understand the superior antibacterial activity of the Ag–GO composite.

本段文章是描述抗菌材料的性質與製備，試說明文章大意。

二、（25%）

Challenges and Opportunities in Light and Electrical Energy Conversion

J. Phys. Chem. Lett. 2011, 2, 1351–1352

The generation and utilization of energy usually involves its conversion from one form to another, for example, light to electrical, electrical to light, light to chemical, electrical to chemical, mechanical to electrical, or chemical to thermal energy. There is always loss in the conversion process, and ideally, that loss should be minimized to the theoretical minimum. To carry out energy conversion or generation, organic, inorganic, or biological materials are used, and the materials cost is a major factor to consider for practical applications. For example, current commercial solar cells use Si as the primarymaterial for converting solar light energy. While the conversion efficiency is quite good, typically near 10% for single-crystalline Si cells, the high cost of Si makes it implausible for widespread utilization.[4] Many alternative materials and strategies have been investigated, including the popular dye-sensitized solar cells[5_7] and, more recently, QD-sensitized solar cells[8-11] or photoelectrochemical cells.[12] However, to date, their practical application has been very limited due to generally low efficiency and/or short cell lifetime.

本段文章是描述能源轉換之挑戰，試說明文章大意。

三、（50%）

Optimizing the Recovery Efficiency of Finnish Oil Combating Vessels in the Gulf of Finland Using Bayesian Networks

Environ. Sci. Technol., 2013, 47 (4), pp 1792–1799

Oil transport has greatly increased in the Gulf of Finland over the years, and risks of an oil accident occurring have risen. Thus, an effective oil combating strategy is needed. We developed a Bayesian Network (BN) to examine the recovery efficiency and optimal disposition of the Finnish oil combating vessels in the Gulf of Finland (GoF), Eastern Baltic Sea. Four alternative home harbors, five accident points, and ten oil combating vessels were included in the model to find the optimal disposition policy that would maximize the recovery efficiency. With this composition, the placement of the oil combating vessels seems not to have a significant effect on the recovery efficiency. The process seems to be strongly controlled by certain random factors independent of human action, e.g. wave height and stranding time of the oil. Therefore, the success of oil combating is rather uncertain, so it is also important to develop activities that aim for preventing accidents.

（一）說明本文大意。(25%)

（二）文章中關於芬蘭灣油汙之處理包含哪些策略？（25%)