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### 材料合成及性能

#### 表面修饰的ZnS:Mn量子点的发光性质及其对生物分子的检测

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摘要：采用水热法制备了ZnS:Mn量子点,探讨了掺杂离子浓度对ZnS:Mn量子点的晶体结构和发光性质的影响。通过荧光光谱对样品进行表征。结果表明:掺杂离子的摩尔分数达到2%时,ZnS:Mn量子点在595 nm附近的发光最强;继续增加掺杂浓度反而出现荧光猝灭的现象。本文还研究了表面修饰对量子点形貌和发光性质的影响。通过透射电子显微镜(TEM)观察样品的形貌,发现经过3-巯基丙酸(MPA)修饰后的样品表面团聚现象得到改善,并且尺寸单一、单分散性较好,平均粒径约为5 nm。经过修饰后的样品减少了表面非辐射性缺陷中心,使掺杂Mn<sup>2+</sup>所引起的595 nm附近的发射峰强度增大。将MPA修饰后的ZnS:Mn量子点与牛血清白蛋白(BSA)分子进行生物偶联,并利用BCA法对偶联上的蛋白含量进行定量检测,结果显示经过修饰后的量子点偶联蛋白的能力更强。

关键词：ZnS:Mn 表面修饰 发光 BCA法检测

#### Luminescent Properties of Surface Modified ZnS:Mn Quantum Dot and Detection of Biological Molecules

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Abstract: ZnS:Mn quantum dots were prepared by hydrothermal method. The effect of the doping concentration of ZnS:Mn quantum dots on crystal structure and luminescent properties was discussed. The quantum dots were characterized by the fluorescence spectroscopy. The results indicated that ZnS:Mn quantum dots exhibited the strongest emission at 595 nm, with 2% doping mole fraction, then with doping concentration increasing, the intensity of luminescent decreased due to the fluorescence quenching phenomenon. The effect of surface modification on the morphologies and luminescent properties of quantum dots were also discussed. Transmission electron microscope (TEM) images indicated that the surface aggregation phenomenon of ZnS:Mn quantum dots was improved with the MPA surface modification, the quantum dots also exhibited single size and good dispersibility properties, the average particle diameter was about 5 nm. In addition, the surface non-radiation defect centers were reduced, which caused emission peak intensity increasing at 595 nm by Mn<sup>2+</sup> doping. The surface modified ZnS:Mn quantum dots were conjugated with bovine serum albumin (BSA) molecules. In BCA detection, the results indicated that the surface modified ZnS:Mn quantum dots had the better biological conjugation property.

Keywords: ZnS:Mn surface modification luminescence BCA detection

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