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## 论文

### 激光诱导沉积银膜制备新型光纤SERS传感器

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#### 摘要:

利用激光诱导沉积的方法直接在光纤端面沉积了银纳米膜,并用SERS光谱监测了这一沉积过程,在光纤端面上生成的银膜出现了“年轮”状宏观形貌,这种形貌与激光在光纤中的干涉与衍射条纹分布相一致,证明了这种现象是由激光诱导反应引发的. 结合实验结果进一步讨论了银纳米膜的形成机理. 在光纤上沉积的银纳米膜作为光纤SERS传感器的基底与其它制备基底的方法比较也具有实验操作简便,耗时短,重现性好,SERS增强效果强等诸多优点,是一种非常好的制备光纤SERS传感器基底的方法.

关键词: 激光诱导; 银沉积; 表面增强拉曼散射; 光纤探针

### Preparation of SERS Optical Fiber Sensor via Laser-induced Deposition of Ag Film on the Surface of Fiber Tip

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#### Abstract:

A novel method of modifying the probe of SERS-optical sensor is described. By using laser-induced deposition and growth of Ag nanoparticles,we prepared a new type of Ag-deposited film with the appearance of annual rings on the fiber tip. A 6 cm-long silica fiber is immersed in the mixture of  $\text{AgNO}_3$  and citrate. A 514.5 nm laser with the power of 4.2 mW is used to reduce the  $\text{Ag(I)}$  to  $\text{Ag(0)}$  and induced  $\text{Ag(0)}$  to deposit onto the fiber tip. SERS spectra of a probe molecule(BPENB) are used to monitor the deposition process. The optical and AFM images display the macro- and micro-appearance of Ag-deposited film. These results show that the laser-induced deposition is a simple and rapid method for modifying the probe of SERS-optical sensor. The Ag film with the proper thickness and roughness is prepared within only about 4.5 min. Moreover,the Ag deposition film prepared by this method shows not only easy reproduction but also remarkable SERS activity. The mechanism of the laser-induced Ag deposition onto the fiber tip was also discussed.

Keywords: Laser induction; Ag deposition; SERS; Optic fiber probe

收稿日期 2005-04-05 修回日期 网络版发布日期

DOI:

基金项目:

国家自然科学基金(批准号: 20375014,20273022和20473029)资助.

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