

## 场效应器件表面修饰对DNA测试性能影响的研究

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摘要:

对比甲醇-盐酸混合物及硫酸处理对场效应器件(Field-effect device,FED)电化学测试性能的影响。实验结果表明,FED表面经过两种方式处理,其电化学阻抗测试特性发生变化,表现在阻抗的虚部值(用 $Z_q$ 表示)随加在FED器件与参比电极之间的电压的变化特性(用 $Z_q-V$ 曲线表示)发生改变。经过硫酸处理的器件的 $Z_q-V$ 曲线相对于未处理器件有微小偏移;而甲醇-盐酸体系处理后曲线在耗尽层区的斜率有所下降,表明这种处理对器件测试性能有负向的影响。经硅烷化固定在表面的氨基采用荧光标记,荧光测试结果表明,两种表面处理方式对硅烷化效果影响不大。进一步通过共价连接在硅烷化FED表面引入探针DNA分子,制备基于FED的DNA传感器。与目标DNA分子杂交反应后,实验表明,硫酸处理的测试结果要好于甲醇-盐酸的处理方法。

关键词: 场效应器件,表面修饰,硅烷化, DNA传感器

## The research of the influence of surface modification on the DNA test characteristics of field effect devices

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**Abstract:**

The influence of the surface modification on the test characteristics of the field effect devices (FED) has been studied. The surface modification was carried out employing sulfuric acid and methanol-HCl solution respectively. The test characteristics were illustrated by the measurement of the out-phase impedance (referred to as  $Z_q$ ) vs bias voltage imposed between the FED and the reference electrode. The  $Z_q-V$  curves are different after different surface modifications. With the sulfuric acid treatment, the  $Z_q-V$  curve changes little, while the treatment by the methanol-HCl solution will cause the decrease of the sensitivity of the FED. The silanization and fluorescein-labeling of the surface after these two kinds of treatment reveal that the treatments cause little influence on the silanization effect of the surface. The FED-based DNA sensors were prepared after the surface modification of the FED. The methanol-HCl treatment will make the readout of the DNA sensor decreased compared with the sulfuric acid treatment.

**Keywords:** field effect device, surface modification, silanization, DNA sensor

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