

过渡金属表面有机官能团硅烷膜的研究——镍电极表面 γ -氨基丙基三甲氧基硅烷膜的结构

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摘要 在镍电极表面制备了 γ -氨基丙基三甲氧基硅烷膜并对其形成和结构进行了研究

。镍电极表面有机官能团硅烷膜的X射线光电子能谱(XPS)结果表明氮、硅等元素在电极表面的存在,并且氨基在膜中有若干种存在方式,包括自由氨基和质子化的氨基。通过对表面增强拉曼散射光谱(SERS)谱图的分析,发现与电极表面作用的吸附基团硅醇羟基和氨基发生了竞争吸附,它们及其邻近基团的拉曼谱线随着电位的负移除了相对强度发生变化以外,还发生了一定的位移,这缘于吸附基团吸附的量和吸附取向随电极电位发生了变化并形成的更为复杂的界面结构;氨基不同存在方式之间也会随之发生转变,这一结果与X射线光电子能谱分析的结果相符合。原子力显微镜(AFM)结果表明镍电极表面的有机官能团硅烷膜呈现为一种较规则的多孔结构。

关键词 [硅烷 P](#) [X射线光电子谱法](#) [表面增强拉曼散射光谱](#) [镍](#) [电极](#) [原子力显微镜](#)

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Study on Films of Organofunctional Silanes on Transition Metal Surfaces-The Structure of γ -Aminopropyltrimethoxysilane Films on Nickel Electrodes

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Abstract In the present paper, we prepared the γ -aminopropyltrimethoxysilane (γ -APS) films on nickel electrode surfaces and studied their formation and structure. XPS results of the films of the organofunctional silanes modified nickel electrodes show the presence of nitrogen and silicon binding energy peaks indicating the presence of γ -APS on the metal surface. The results also indicate that the amine is presented in several different states, including the free amine and the protonated one. The potential-dependent Raman spectra gave plenty of information of γ -APS/metal interface, the silanol and amino groups adsorbed competitively on the nickel surfaces. While the applied potential was changed negatively from open circuit potential, the peak intensity of the SERS spectra of these adsorptive groups and the adjacent groups changed and the frequencies of the bands red-shifted. It is assumed that the quantity and adsorptive orientation of the adsorptive groups changed with the change in the potential and formed more complicated structure of interface. It was also found that the different states of amine transformed with the change in the potential, this can be confirmed by the results of XPS. Atom force microscopy (AFM) was applied to characterize the silane films. It could be concluded that the films of the organofunctional silanes are porous on the microscopic scale.

Key words [SILANE P](#) [XPS](#) [surface-enhanced raman spectroscopy](#) [NICKEL](#) [ELECTRODE](#) [AFM](#)

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