

覆钨膜阴极表面同步辐射光电子谱研究

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Study on Surface of Impregnated Cathodes Coated Os Film by Synchronous Radiation Photoelectron Spectrum

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摘要

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摘要 为何浸渍阴极表面覆一层高功函数的钨(Os)膜后发射能力可以显著增加? 这是一个长期未搞清的重要问题。该文在对阴极进行发射性能测试和扫描电镜分析的基础上, 利用同步辐射光电子谱装置, 对覆钨(W)膜阴极和覆Os膜阴极表面的元素成分及化学状态进行了全面系统的研究。结果表明, 覆Os膜阴极的电子发射能力是覆W膜阴极2.65倍; 与覆W膜相比, 覆Os膜使阴极表面的钡(Ba)原子和低结合能态的吸附氧(O)原子分别增加了40%和56%。进一步分析认为, Os膜具有易氧化及氧化物易分解的特性, 这一特性决定了覆Os膜阴极在激活后可以获得更多的超额钡Ba⁺(a), 并因此具备更高的电子发射能力。

关键词: 浸渍阴极 钨(Os)膜 同步辐射光电子能谱 化学态 超额钡

Abstract: Why a layer of Os film with high work function can increase the emission ability of impregnated cathode notably? This is an undecided important problem for a long time. In this article, based on the emission test and scanning electron microscope analyzing, the Synchronous Radiation Photoelectron Spectrum (SRPES) technology is used to measure element composition and chemical states on W-film cathodes and Os-film cathodes. The results indicate, the emission ability of the cathode coated with Os-film is higher than that coated with W-film by 1.65 times, and Os-film can increase the number of barium atom and low binding energy oxygen atom on the surface of cathodes by 40% and 56% comparing to W-film. With further analysis, the low melting point and characteristics apt to resolve for the oxides of Os film, accelerate the transformation of oxygen on cathode surface during activation, thus cause the Os-film cathode surface to get more surplus barium Ba⁺(a) and to get higher emission ability.

Keywords: Impregnated cathode Os film Synchrotron radiation photoelectron spectroscopy Chemical state Surplus barium

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