

论文

Na₂KSb膜层组份均匀性对多碱阴极灵敏度的影响研究李晓峰^{1,2}, 陆胜林², 杨文波², 赵学峰²

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摘要:

介绍了多碱光电阴极Na₂KSb膜层荧光光谱的测量原理,测量了两个Na₂KSb膜层样品在不同半径位置的荧光光谱.测量数据表明,Na₂KSb膜层荧光光谱的峰值波长从阴极面的中心到边缘逐步增大,同时峰值荧光强度也逐步增强.原因是阴极窗表面的铟原子密度从中心向边缘逐步减小.当Na₂KSb膜层中的铟超过Na₂KSb所需的化学计量比时,荧光峰值波长向短波方向移动,同时荧光强度减弱;当Na₂KSb膜层中的铟达到Na₂KSb所需的化学计量比时,荧光峰值波长达到最大,同时荧光强度也达到最强.通过荧光测试,可以判断Na₂KSb膜层的化学计量比是否达到2:1:1或膜层中的铟是否过量.同时通过测量阴极面上不同位置的荧光光谱,可以测量Na₂KSb膜层在阴极面上的组份均匀性.铟在阴极面上的原子密度越均匀,利用整个阴极面上的光电流变化来监控阴极膜层生长的方法就更准确,组份均匀性也更好,Na₂KSb膜层的厚度可以更厚,对长波可见光的吸收更多,阴极的灵敏度也更高.因此在像增强器多碱阴极的制造过程中,要尽量使蒸发在阴极窗表面的铟原子密度均匀,这样才能获得更高的阴极灵敏度.

关键词: 光致荧光 多碱阴极 荧光光谱 光电发射

Component Uniformity Study on Na₂KSb Film of Multi-alkali PhotocathodeLI Xiao-feng^{1,2}, LU Shing-lin², YANG Wen-bo², ZHAO Xue-feng²

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Abstract:

The measurement principle of fluorescence spectrum on Na₂KSb film of multi-alkali photocathode was described and three samples were measured in the position of different radius. The data result shows that the peak wavelength of fluorescence spectrum on Na₂KSb film from center to edge of the cathode surface gradually increases, and the peak fluorescence intensity gradually increased as well. The reason is that the antimony atom density of cathode surface from the center to the edge gradually reduces. When the antimony in Na₂KSb film exceeds stoichiometry required, the fluorescence peak wavelength shifts towards the short-wave direction, while the fluorescence intensity decreased at the same time. When the antimony in Na₂KSb film achieves stoichiometry required, the fluorescence peak wavelength reaches the maximum value, while the fluorescence intensity reaches the strongest at the same time. By fluorescence test one can judge whether the stoichiometry of Na₂KSb film reaches to the ratio 2:1:1 or not, in another words whether antimony in Na₂KSb film is overdose or not. In addition by measuring the fluorescence spectra at different positions of the cathode surface, we can measure component uniformity in the Na₂KSb cathode film. The more uniform antimony atom density is in the cathode surface, the more accurate the monitor method of film growth by measuring changes of the cathode photocurrent is, thus component uniform can be better, Na₂KSb film thickness can be thicker, long-wave absorption of visible light is more, the sensitivity of the cathode is higher. Therefore, during the manufacturing process of multi-alkali cathode of image intensifier, one has to make the uniform antimony atoms density on cathode window surface in order to achieve higher sensitivity.

Keywords: Photoluminescence Multi-alkali photocathode Spectra Photoemission

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