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论文

CR-CVD方法生长a-SiN$_x$:H薄膜的研究

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摘要 使用微波电子回旋共振等离子体化学气相沉积（ECR-CVD）方法室温生长了非晶氢化的氮化硅薄膜，通过改变前驱气体（SiH_4＋80％Ar和NH_3）的流量比，研究了薄膜的生长速率、
等离子体的发射光谱和薄膜的红外特性。结果表明：随着NH3流量的增加，
氮化硅薄膜的生长速率呈下降趋势，
这主要是由于等离子体中的气相前驱成分之一硅基团浓度的不断下降所导致的；随着NH_3流量的增加，
薄膜中键合了较多的具有较高电负性的N原子是Si-N和Si-
H伸缩振动发生蓝移的主要原因。红外光谱的定量计算表明所制备的氮化硅薄膜具有相对较低的H浓度，约15％左右。文中对氮化硅薄膜的生长机制也进行了讨论。

关键词 ECR-CVD a-SiNx:H薄膜 发射光谱 红外光谱

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Study on a-SiN$_x$:H films prepared by ECR-CVD

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Abstract Electron cyclotron resonance plasma enhanced chemical vapor deposition was used to produce amorphous hydrogenated silicon nitride (a-SiNx:H) under different gas flow ratios of SiH4 (80% Ar diluted) and NH3. Optical emission spectroscopy was used to investigate the plasma behavior, while Fourier Transform Infrared (FTIR) was used to measure the bond configuration of a-SiNx:H films. It is found that the variation of Si radical concentration in the plasma causes the decrease of the film growth rate with the increase of NH3 flow rate. The blue shift for Si-N and Si-H stretching mode with the increasing NH3 flow rate can be attributed to that more N atoms with a higher electro-negativity are bonded into the a-SiNx:H film. The amount of bonded hydrogen into the a-SiNx:H films is calculated to be of a rather low level, about 15% or so. The growth mechanism of a-SiNx:H films is also discussed.

Key words ECR-CVD a-SiNx:H film optical emission spectroscopy FTIR

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