

## 论文

**488 nm连续激光晶化本征非晶硅薄膜的喇曼光谱研究**

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## 摘要:

利用等离子增强化学气相沉积系统制备了本征非晶硅薄膜,并选用488 nm波长的连续激光进行晶化.采用喇曼测试技术对本征非晶硅薄膜在不同激光功率密度和扫描时间下的晶化状态进行了表征,并用514 nm波长与488 nm波长对样品的晶化效果进行了比较.测试结果显示:激光照射时间60 s,激光功率密度在 $1.57 \times 10^5$  W/cm<sup>2</sup>时,能实现非晶硅向多晶硅的转变,在功率密度达到 $2.756 \times 10^5$  W/cm<sup>2</sup>时,有非晶开始向单晶转变,随着激光功率密度的继续增加,晶化结果仍为单晶;在功率密度为 $2.362 \times 10^5$  W/cm<sup>2</sup>下,60 s照射时间晶化效果较好;在功率密度为 $2.756 \times 10^5$  W/cm<sup>2</sup>和照射时间为60 s的条件下,用488 nm波长比514 nm波长的激光晶化本征非晶硅薄膜效果较好,并均为单晶态.

**关键词:** 喇曼光谱 单晶硅 激光晶化 多晶硅 本征非晶硅

**Raman Spectroscopic Study of the Crystallization of Intrinsic Amorphous Silicon Thin Films with a 488 nm Continuous-wave Laser**

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## Abstract:

Intrinsic amorphous silicon thin films were prepared by plasma enhanced chemical vapor deposition method, and the crystallization of the films by 488 nm and 514 nm continuous-wave laser under different power densities and irradiation time were studied by micro-Raman spectroscopic measurements. It is shown that intrinsic amorphous silicon films are able to be crystallized within 60 s at laser power densities is above  $1.575 \times 10^5$  W/cm<sup>2</sup>. When the power density reaches to  $2.756 \times 10^5$  W/cm<sup>2</sup>, there is transformation from amorphous silicon to single-crystalline silicon. With the increase of the laser power density, it is still single-crystalline silicon. At the laser power density of  $2.362 \times 10^5$  W/cm<sup>2</sup>, 60 s irradiation time crystallized the effect is better; and at the power density of  $2.756 \times 10^5$  W/cm<sup>2</sup>, the effect of crystallization with 488 nm wavelength is better than that of with 514 nm in 60 s, and they are all single-crystalline silicon.

**Keywords:** Raman spectroscopy Single-crystalline silicon Laser crystallization Polycrystalline silicon Intrinsic amorphous silicon

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