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技术及应用

Xe^{23+}离子辐照Al_2O_3的光谱特性

宋银1，2，谢二庆2，张崇宏1，周丽宏1，李玉红2，杨义涛1， 姚存峰1，李炳生1，马艺准1，缑洁1

1.中国科学院 近代物理研究所，甘肃 兰州 730000 2.兰州大学 物理科学与技术学院，甘肃

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摘要 本工作研究460 keV、3 MeV和308 MeV Xe^{23+}辐照Al_2O_3单晶样品的光致发光特性。从经过460 keV Xe^{23+}辐照后样品的光致发光测试结果可看到，波长为380、413和450 nm的发光峰明显增强，在390和564 nm处出现了新的发光峰。从3 MeV的Xe^{23+}辐照后样品谱的变化可看到，在较低剂量条件下，516 nm(2.4 eV)和564 nm(2.2 eV)处的发光峰随辐照剂量增加而增强，且当剂量增到1×10^{16} cm^{-2}时，564 nm处的发光峰消失，只有516 nm(2.4 eV)处的发光峰较强。从308 MeV Xe^{23+}辐照后样品的光致发光谱中可看到，357 nm(3.47 eV)和516 nm(2.4 eV)处的发光峰随着剂量增加明显增强。辐照后样品的FTIR谱显示：波数在460～510 cm^{-1}和630 cm^{-1}附近的吸收是Al_2O_3振动模式，经离子辐照后，吸收带展宽；1 000～1 300 cm^{-1}间为Al—O—Al桥氧键的伸缩振动模式，高能辐照后的吸收带向低波数方向移动。

关键词 Xe^{23+}离子；Al_2O_3；重离子辐照；光致发光谱

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Photoluminescence Character of Xe Ion Irradiated Sapphire

SONG Yin1,2, XIE Er-qing2, ZHANG Chong-hong1, ZHOU Li-hong1, LI Yu-hong2,
YANG Yi-tao1, YAO Cun-feng1, LI Bing-sheng1, MA Yi-zhun1, GOU Jie1

1.Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China; 2. School of Physical Science and Technology, Lanzhou University, Lanzhou 730000, China

Abstract The photoluminescence (PL) character of sapphire irradiated with 460 keV, 3 MeV and 308 MeV Xe ions were studied. The PL measurements show that the absorption peaks located at 380, 413, and 450 nm are increased, and new peaks are appeared at 390 and 564 nm in irradiated samples with 460 keV Xe ions. The PL measurements also show that the absorption peaks located at 516 and 564 nm appear in irradiated samples with 3 MeV Xe ions, and when the Xe ions fluency is increased to 1×10^{16} cm^{-2}, the peak at 564 nm is disappeared. The PL measurements show that the absorption peaks are appeared at 357 and 516 nm for the irradiated samples with 308 MeV Xe ions, and the peak become more and more strong with increase of Xe ions fluencies. Infrared spectra show a broadening of the absorption band between 460 cm^{-1} and 630 cm^{-1} indicating strongly damaged regions formed in the Al_2O_3 samples and position shift of the absorption band in 1 000^{-1} 300 cm^{-1} towards to low wavenumber.

Key words Xe^{23+} ion Al_2O_3 heavy ion irradiation photoluminescence spectra

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