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## 论文

### $\text{Ge}_{28}\text{Sb}_6\text{S}_{(66-x)}\text{Se}_x$ 玻璃系统光学特性与结构

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摘要:

采用熔融-急冷法制备了系列 $\text{Ge}_{28}\text{Sb}_6\text{S}_{(66-x)}\text{Se}_x$  ( $x=0, 10, 20, 30$  摩尔比) 硫系玻璃样品. 分别测试了样品的密度、折射率、可见-近红外透过光谱、红外透过光谱以及喇曼光谱, 并分析了在Ge-Sb-S中引入Se对其物理、光学特性的影响. 利用喇曼光谱讨论了玻璃的结构与特性之间的关系. 结果表明: 随着Se含量的增加, 样品的密度和线性折射率都增大, 可见和红外截止波长都发生红移, 纯硫化物玻璃样品主要由 $\text{GeS}_4$  四面体和 $\text{SbS}_3$  三角锥组成, 随着Se逐渐代替S, 硫-硒混合样品中逐渐出现了 $\text{GeS}_{4-x}\text{Se}_x$  结构单元以及链状和环状的Se-Se键.

关键词: 硫系玻璃 光学特性 拉曼光谱 透过光谱

## Optical Properties and Structure of $\text{Ge}_{28}\text{Sb}_6\text{S}_{(66-x)}\text{Se}_x$ Glasses

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**Abstract:**

A serial of chalcogenide glasses with the composition of  $\text{Ge}_{28}\text{Sb}_6\text{S}_{(66-x)}\text{Se}_x$  ( $x=0, 10, 20, 30$ , molar fraction) are prepared by the melt-quenching technique. The densities, refractive indexes, VIS-NIR transmission spectra, IR transmission spectra and Raman spectra of the samples are measured respectively. The impact of the presence of Se on the physical and optical properties of Ge-Sb-S glass system are analyzed. The Raman spectra are used to discuss the relationship between structures and properties. Results show that with increasing Se content, the densities and refractive indexes of the samples increase, and the visible and IR cut-off edges shift towards longer wavelengths. The basic structural units of the pure sulfide glass are  $\text{GeS}_4$  tetrahedra and  $\text{SbS}_3$  pyramids. With the substitution of S by Se, the sulfur-selenide-containing samples present  $\text{GeS}_{4-x}\text{Se}_x$  units and Se-Se homopolar bonds both in rings and in chains.

**Keywords:** Chalcogenide glass   Optical properties   Raman spectra   Transmission spectra

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## 参考文献:

- [1] ZHAO Dong-hui, NIE Jia-xiang, CHEN Guo-rong, et al. The IR transmitting properties of new novel chalcogenide glasses[C]. Beijing: The Chinese Ceramic Society, 2003: 176.  
赵东辉, 聂佳相, 陈国荣, 等. 新型硫系玻璃的红外光学透过性能研究[C]. 北京: 中国硅酸盐学会2003年学术年会论文摘要集, 2003: 176.
- [2] XUE Jian-qiang, XU Man, GONG Yue-qiu, et al. Preparation, characteristic and application of chalcogenide glasses[J]. Optoelectronic Technology and Information, 2003, 16(4): 28-31.  
薛建强, 徐曼, 龚跃球, 等. 硫系玻璃的制备、特性及应用[J]. 光电子技术与信息, 2003, 16(4): 28-31.
- [3] ZAKERY A, ELLIOTT S R. Optical properties and application of chalcogenide glasses: a review[J]. Journal of Non-Crystalline Solids, 2003, 330(1-3): 1-12.
- [4] EI-SAYED M F. Optical properties of amorphous  $\text{Ge}_{30-x}\text{Sb}_x\text{S}_{70}$  films[J]. Optics and Laser Technology, 2006, 38(1): 14-18.
- [5] PETIT L, CARLIE N, ADAMIETZ F, et al. Correlation between physical, optical and structural properties of sulfide glasses in the system Ge-Sb-S [J]. Materials Chemistry and Physics, 2006, 97(1): 64-70.
- [6] CHU Sai-sai, LI Feng-ming, TAO Hai-zheng, et al.  $\text{SbS}_3$  enhanced ultra fast third-order optical nonlinearities of Ge-S chalcogenide glasses at 820 nm[J]. Optical Materials, 2008, 31(2): 193-195.
- [7] JIAN Zeng-yun, ZHENG Chao, CHANG Fang-e, et al. Effect of composition on characteristic temperature and properties of  $\text{Ge}_x\text{Se}_{90-x}\text{Sb}_{10}$  glasses[J]. Journal of Xi'an Technological University, 2009, 29(1): 52-55.  
坚增运, 郑超, 常芳娥, 等. 成分对  $\text{Ge}_x\text{Se}_{90-x}\text{Sb}_{10}$  玻璃特征温度及性能的影响[J]. 西安工业大学学报, 2009, 29(1): 52-55.
- [8] SHEN Xiang, NIE Qiu-hua, XU Tie-feng, et al. Investigation of nonlinear absorption coefficient in  $\text{Ge}_{20}\text{Sb}_5\text{Se}_{75}$  glass[J]. Journal of Wuhan University of Technology, 2007, 29(Z1): 185-187.  
沈祥, 聂秋华, 徐铁峰, 等.  $\text{Ge}_{20}\text{Sb}_5\text{Se}_{75}$  玻璃的三阶非线性吸收系数研究[J]. 武汉理工大学学报, 2007, 29(Z1): 185-187.

[9]PETIT L, CARLIE N, VILLENEUVE R, et al. Effect of the substitution of S for Se on the structure and non-linear optical properties of the glasses in the system  $\text{Ge}_{0.18}\text{Ga}_{0.05}\text{Sb}_{0.07}\text{S}_{0.70-x}\text{Se}_x$ [J]. Journal of Non-Crystalline Solids, 2006, 352(50-51): 5413-5420.

[10]NEMEC P, FRUMAROVA B, FRUMAR M. Structure and properties of the pure and  $\text{Pr}^{3+}$ -doped  $\text{Ge}_{25}\text{Ga}_5\text{Se}_{70}$  and  $\text{Ge}_{30}\text{Ga}_5\text{Se}_{65}$  glasses[J]. Journal of Non-Crystalline Solids, 2000, 270(1-3): 137-146.

[11]FRUMAROVA B, NEMEC P, FRUMAR M, et al. Synthesis and optical properties of the Ge–Sb–S: PrCl<sub>3</sub> glass system[J]. Journal of Non-Crystalline