$YTi_{40}Zr_{25}Cu_9Ni_8Be_{18}$

Shan, Z.T.; Ruan, B.W.; Tao, H.Z.; Yue, Yuanzheng

DOI (link to publication from Publisher):
10.11868/j.issn.1001-4381.2017.001622

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

Link to publication from Aalborg University

Citation for published version (APA):
Shan, Z. T., Ruan, B. W., Tao, H. Z., & Yue, Y. (2018). $YTi_{40}Zr_{25}Cu_9Ni_8Be_{18}$. 88-93.
https://doi.org/10.11868/j.issn.1001-4381.2017.001622

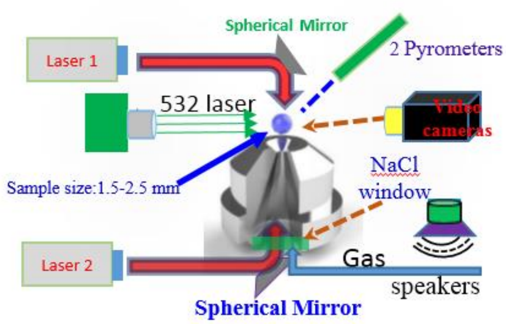
Structural origin of the mixed modifier effects in aluminosilicate glasses

Zhitao Shan[1], Bowen Ruan[1], Haizheng Tao[1], Yuanzheng Yue[1,2]

[1]*State Key Laboratory of Silicate Materials for Architectures, Wuhan University of Technology, Wuhan 430070, China*

[2]*Department of Chemistry and Bioscience, Aalborg University, DK-9220 Aalborg, Denmark*

To understand the mixed modifier effect in oxide glasses, it is important to reveal the structure-property relation. Recently, we have made some progress in understanding such relation [1-3]. It is established that the cation can play the role of network-modifier, pseudo network-former and charge balancer in the network. In this talk, we present our findings about the mixed modifier effects in aluminosilicate glasses prepared by both the aerodynamic levitation technique (see the figure below) and/or the traditional melt-quenching method, respectively. By performing indentation experiments, we found that the glass hardness exhibits a negative deviation from linearity as the network modifier, a positive deviation from linearity as pseudo network-former and a linear trend as the charge balancer. Besides glass hardness, we also determined the mixed modifier effects on several other properties such as glass transition temperature, isokom temperature, surface tension, density and thermal expansion coefficient. We revealed the structural origin of the mixed modifier effects on the above-mentioned properties by means of the combined techniques including differential scanning calorimetry, viscometer, Raman spectroscopy, and nuclear magnetic resonance.



Aerodynamic levitator furnace

ADL can measure the viscosity, density, and surface tension of supercooled liquids of poor glass formers

Various Advantages

- Reach high liquid temperatures (>3000°C)
- These methods maintain the sample purity
- Easy access to the supercooled state (few hundred degrees below the melting point)

Schematic representation of aerodynamic levitator furnace

References:

1. Z.T. Shan, C.J. Li, H.Z. Tao, Mixed alkaline earth effect on the mechanical and rheological properties of Ca-Mg silicate glasses. *J. Am. Ceram. Soc*., 100 (2017) 4570-4580.
2. Z.T. Shan, A. Qiao, S.J. Liu, H.Z. Tao, Mixed intermediate effect on mechanical and rheological performances in Zn-Mg silicate glasses. J. Alloys Compd. 747 (2018) 738-746.
3. Z.T. Shan, S.J. Liu, H.Z. Tao, Y.Z. Yue, Mixed alkaline-earth effect on mechanical and rheological performances in aluminate glasses. *J. Am. Ceram. Soc*. 2018 (in press) doi: 10.1111/jace.15975