

# Investigation of $x\text{Fe}_2\text{O}_3 \cdot (100-x)[\text{P}_2\text{O}_5 \cdot \text{Li}_2\text{O}]$ glass samples by means of PIXE, PIGE and RBS methods

C. Andronache<sup>a</sup>, M. Balasoiu<sup>b,c</sup>, D. Racolta<sup>a</sup>

<sup>a</sup>Technical University of Cluj Napoca, North University Center of Baia Mare, Str. Victoriei 76 430122, Baia Mare, Romania.

<sup>b</sup>Joint Institute for Nuclear Research, Dubna, Russian Federation

<sup>c</sup>Horia Hulubei National Institute of Physics and Nuclear Engineering, Magurele, Romania  
e-mail:daniaracolta@yahoo.com

Glass systems of  $x\text{Fe}_2\text{O}_3 \cdot (100-x)[\text{P}_2\text{O}_5 \cdot \text{Li}_2\text{O}]$  with  $0 < x < 50$  mol% have been prepared and characterized by magnetic susceptibility [1].

Samples were prepared by weighing the appropriate proportions of components, mixing them, and melting the powder mixture sintered corundum crucibles at 977K for 5 minutes.

The starting materials used in the present investigation were  $(\text{NH}_4)_2\text{HPO}_4$ ,  $\text{Li}_2\text{CO}_3$  and  $\text{Fe}_2\text{O}_3$  of reagent grade purity.

The mixtures were put into the furnace directly at this temperature. The melts were poured into stainless steel plates.

The structure of samples was analyzed by means of X-ray diffraction using a Bruker D8 ADVANCE X-ray Diffractometer. The pattern obtained did not reveal any crystalline phase in the samples up to 50mol %  $\text{Fe}_2\text{O}_3$ .

The magnetic susceptibility ( $\chi$ ) measurements were performed with a Faraday-type balance which give some information about magnetic field strength in the temperature range 80-300K. Correction due to the diamagnetism of the  $\text{P}_2\text{O}_5$ ,  $\text{Li}_2\text{O}$  and  $\text{Fe}_2\text{O}_3$  were taken into account in order to obtain the real magnetic susceptibility of iron ions in the studied glasses.

The iron ions generally modify in a different way the local structure of these glasses, depending on the presence of the  $\text{Li}_2\text{O}$  in the glass matrix. The results have shown the presence of antiferromagnetic or ferromagnetic interactions between the iron ions in the studied glass and temperature range. These data revealed that the valence states and the distribution of iron ions in the glass matrix depend on the  $\text{Fe}_2\text{O}_3$  content, and can determine the decreasing of magnetic momentum ( $\mu_{\text{eff}}$ ).

The obtained systems are new and detailed investigations of the resulted compounds are necessary. For the confirmation of the compounds stoichiometry PIXE, PIGE and RBS measurements are proposed.

## References

[1] C. Andronache, M. Balasoiu, c, and D. Racolta, *Russian Journal of Physical Chemistry A*, 91(13), 198–201 (2017)