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THE INFLUENCE OF FLUORINE UPON THE THERMAL AND MECHANICAL PROPERTIES OF FLUOROPHOSPHATE GLASSES

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Owing to increased interest in development of fluoride glass optical fibres it is interesting to know the properties relevant to fibre waveguide fabrication obtained for the fluorophosphate glasses with different content of fluorine.

TMF and DTA measurements have been carried out with DUPONT 1090 TA analyser on the series of fluorophosphate glasses. The compositions of glasses were based on the systems $NaPO_3$ and $NaPO_3$-CaF_2-AlF_3. Fluorophosphate glass samples were prepared from mixtures of anhydrous components with, and without addition of ammonium bifluoride as a fluorinating agent. They were melted in covered platinum crucible and annealed for TMA measurements samples. The fluorine content in glass was determinated with F^- ion-selective electrode.

The introdution of fluorine in the aluminofluorophosphate glasses strongly increases the thermal dilatometry coefficient (α). The increase in fluorine content from 8,25% to 19,6% gives a change in α from $19{,}6 \cdot 10^{-6}K^{-1}$ to $24.8 \cdot 10^{-6}K^{-1}$. The addition of CaF_2 in the aluminofluorophosphate glass limits the fluorination of initial mixtures, and consequently the changes in α are smaller. The difference in α for the unfluorinated and fluorinated glass based on the system $0{,}3AlF_3$-$0{,}10CaF_2$-$0{,}6NaPO_3$ was only 6.8%.

DTA measurements showed that the introduction of fluorine in fluorophosphate glasses tend to extend the $\Delta T=T_c-T_g$ region by lowering T_g.