EFFECT OF γ- RADIATION ON DC CONDUCTION IN $AgPO_3$ GLASS

M. K. El-Mansy, F. Salman and H. Hazza
Faculty of Science, Zagazig University at Benha, Egypt.

The temperature dependence of d.c. conductivity of unirradiated and γ-irradiated $AgPO_3$ glass illustrates the semiconducting behaviour obeying Arhenious relation in the range 303 to 373 °K. A remarkable change in conductivity value and activation energy value of $AgPO_3$ glass irradiated with different γ-doses are recorded. The effect of isothermal annealing on conductivity of γ-irradiated $AgPO_3$ shows a rate process indicating the annealing out of the produced electronic defects in $AgPO_3$ glass. The study of conduction at high fields for investigated samples show a deviation from ohmicity which suggests the formation of space charge region. A reasonable values of mobility, carrier concentration and diffusivity are deduced and discussed.

Introduction

Silver - ion containing glasses are of current interest for their significant technological applications. These glasses could be used as solid electrolytes, semicondcting elements, photochemical sensors and radiation dosemetrs (1,2,3). The silver metaphosphate glass has shown that the structure consists of PO_4 tetrahedra which is essentially cross linked by metallic ions (4,5) . Each PO_4 group ideally contains two nonbridging oxygen ions. The high conduction of such glasses were considered to be ionic in nature. The electronic configuration of glass matrix considerable affects the ion transport and therefore the conductivity.

The irradiation of a glass with ionizing radiation such as γ-tradiation may excit electrons which may be captured by the intrinsic shallow or deep traps in the glass and lift behind a positive vacant (hole). The presence of such electonic defects may alter the physical properties of the glass. These defects may be annealed out by heat which leads to the electron-hole recombination and the produced energy would emitted as photons (thermoluminsilnce). The formation and stability of these defects are critically dependent on sliver content, temperature and the period of irradiation (6).