
Contribution ID: **155** Type: **Poster**

# Radiochemical Stability and Life Time of LDPE-Based Flexible Composite Filled with Ce-Doped PZT-PbZrTiO3

*Thursday, 27 April 2017 14:15 (2 hours)*

The inorganic compounds like mixed oxides doped with certain low amounts of salts play the role of stabilizers for many polymer matrices. This property is related to the crystalline network, where the difference in charge distribution allows the scavenging new formed radicals. During the irradiation of polymers the basic processes involve free radicals. They must not be consumed in parallel reactions as it is occurred in their oxidative degradation. Under this condition, the doped inorganic phase behaves as an antioxidant. Its protection activity is similar to the synthesis antioxidants, which delay the decay of free radicals by their reactions with molecular oxygen.
The preparation of Ce-doped PZT –PbZrTiO3 was accomplished by heat treatment at 920 oC for 4 h of lead oxide, zirconia and titania with four concentrations (0.25, 0.50, 0.75 and 1.25 w/w%) of cerium chloride. After milling and drying, the powder was added in low density polyethylene in various proportions (3 and 5 w/w%). The XRD and granulometry on inorganic compound were done for the depicting the morphological state. The films and plaques were obtained by pressing at 175 oC for 5 minutes. Gamma irradiation was accomplished in air at room temperature in Ob Servo Sanguis (Hungary) irradiator provided with 60Co source, whose dose rate was 1.1 kGy h-1. The exposure doses were 25, 50, 100 and 200 kGy which were compared with pristine samples. The stability characterization of modified LDPE samples was performed by FT-IR spectroscopy, isothermal (190 oC) and nonisothermal (heating rate 10 oC min-1) chemiluminescence and thermal analysis.
The increasing dependence of protection efficiency on the concentration of dopant in inorganic filler explains the participation of these structural defects at the coupling of oxidizable free radicals. The oxidation state of basic polymer is described by the increases in carbonyl and hydroxyl indexes, which allow the calculation of the radiochemical yields for these degradation products. The stabilization effect is related to the surface activity of powder, whose grain size distribution influences the amplitude of protection.
The factors that influence the stabilization activity and kinetic parameters of oxidative degradation are doping degree, the filler concentration and the exposure dose, which determine the interaction probability between solid state defects and free radicals prior their oxidation.
The expected stabilization feature is the required feature for the preservation of low oxidation level in many organic products like polymers, paints, vanishes, anticorrosive layers, used in different areas of nuclear units especially nuclear power plants or during their radiation processing.

## Country/Organization invited to participate

Romania

**Primary author:** Mr ZAHARESCU, Traian (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania)

**Co-authors:** Ms DUMITRU, Alina (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania); Mr PANAITESCU, Denis (ICECHIM Bucharest, Romania); Ms SBARCEA, Gabriela (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania); Ms VELCIU, Georgeta (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania); Mr MARINESCU, Virgil (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania)

**Presenter:** Mr ZAHARESCU, Traian (Nuclear Agency and Radioactive Wastes, INCDIE ICPE - CA, Romania)

**Session Classification:** P-A2

**Track Classification:** RADIATION SYNTHESIS AND MODIFICATION OF MATERIALS