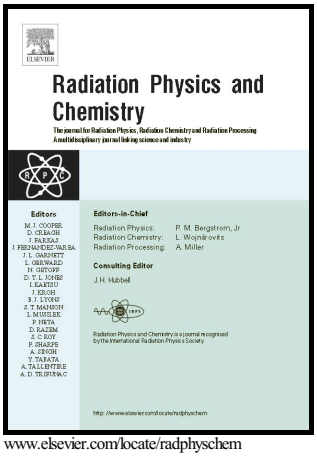
Determining Optical and Radiation Characteristics of Cathode Ray Tubes' Glass to be reused as Radiation Shielding Glass

A. Zughbi, M.H. Kharita, A. Shehada



www.elsevier.com/locate/radphyschem

PII: S0969-806X(16)30648-X
DOI: http://dx.doi.org/10.1016/j.radphyschem.2017.02.035
Reference: RPC7437

To appear in: *Radiation Physics and Chemistry*

Received date: 8 November 2016
Accepted date: 16 February 2017

Cite this article as: A. Zughbi, M.H. Kharita and A. Shehada, Determining Optical and Radiation Characteristics of Cathode Ray Tubes' Glass to be reused as Radiation Shielding Glass, *Radiation Physics and Chemistry* http://dx.doi.org/10.1016/j.radphyschem.2017.02.035

Determining Optical and Radiation Characteristics of Cathode Ray Tubes' Glass to be reused as Radiation Shielding Glass

A.Zughbi[1] , M.H.Kharita[2] , A.Shehada[3]

[1,3] *Department of Physics,Faculty of Sciences,Damascus University,Damascus, Syria*
[2] *Department of Protection and Safety,AECS,P.O.Box 6091,Damascus, Syria*

Abstract

A new method of recycling glass of Cathode Ray Tubes (CRTs) has been presented in this paper. The glass from CRTs suggested being used as raw materials for the production of radiation shielding glass. Cathode ray tubes glass contains considerable amounts of environmentally hazardous toxic wastes, namely heavy metal oxides such as lead oxide (PbO). This method makes CRTs glass a favorable choice to be used as raw material for Radiation Shielding Glass and concrete. The heavy metal oxides increase its density, which make this type of glass nearly equivalent to commercially available shielding glass. CRTs glass have been characterized to determine heavy oxides content, density, refractive index, and radiation shielding properties for different Gamma-Ray energies. Empirical methods have been used by using the Gamma-Ray source cobalt-60 and computational method by using the code XCOM. Measured and calculated values were in a good compatibility. The effects of irradiation by gamma rays of cobalt-60 on the optical transparency for each part of the CRTs glass have been studied. The Results had shown that some parts of CRTs glass have more resistant to Gamma radiation than others. The study had shown that the glass of cathode ray tubes could be recycled to be used as radiation shielding glass. This proposed use of CRT glass is only limited to the available quantity of CRT world-wide..

1 Introduction

The generated amount of waste electrical and electronic equipment (WEEE) or e-waste in the world is growing rapidly as shown in Fig.1. The content of hazardous components in electrical and electronic equipment (EEE) is a major concern during the waste management phase. Ideally, the materials in electronic products should be re-used when the products reach the end of their service life.

In the European Union (EU), WEEE represents about 7.5 million tons each year, where computer monitors and TV sets containing cathode-ray tubes (CRTs) represent about 80 % of the total electronic waste [1],[2].

Huge amounts of toxic wastes (for example lead compounds) affect the environment. The total amount of lead in 315 million of personal computers exhausted between 1997 and 2004 in the united states is about 600 000 tons [3]. Additionally, these amounts of personal computers contain about 151.2 tons of gold and 1786.1 tons of silver [4],[5]. The aforementioned statistics indicate to the need to the development of new methods to recycle these costly (both economically and environmentally) products. The glass of cathode ray tubes (CRT) can be classified according to its chemical composition

[1]zughbi.family@gmail.com
[2]mhkharita@gmail.com
[3]abdollahsh137@gmail.com