

# Effects of Gamma Radiation on Tertiary Butylhydroquinone and its Dosimetric Features

Hasan Tuner<sup>a</sup> and Mustafa Korkmaz<sup>b</sup>

<sup>a</sup> Department of Physics, Faculty of Science, Balikesir University, Çağış, 10145, Balikesir, Turkey

<sup>b</sup> Department of Physics Engineering, Faculty of Engineering, Hacettepe University, Beytepe, Ankara, 06800, Turkey

Reprint requests to Dr. H. T.; Fax: +90 312 299 20 37; E-mail: htuner@hacettepe.edu.tr

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The effects of gamma radiation on tertiary butylhydroquinone (TBHQ) are reported using electron spin resonance (ESR) spectroscopy. While unirradiated (control) TBHQ exhibited no ESR signal, irradiated one presented an ESR spectrum with five characteristic resonance peaks extended over a magnetic field region of 1.5 mT. Variations of the heights of the resonance peaks and the spectrum area as function of the microwave power, applied dose, storage time, and temperature were studied. The kinetic features and spectroscopic parameters of the species responsible for the experimental ESR spectrum were investigated by annealing studies performed at four different temperatures and simulation calculations, respectively. A model based on the presence of two species having different kinetic and spectroscopic features was found to describe best the experimental results. The dosimetric potential of TBHQ was also investigated, and it was concluded that the discrimination of irradiated TBHQ from unirradiated one was possible even long after the radiation treatment, and that radiation doses above 5 kGy could be measured with an accuracy better than 3% by using TBHQ. Two tentative radical species were proposed.

*Key words:* Radiation; TBHQ; Electron Spin Resonance (ESR); Radical.