

## The Effect of Gamma rays on Physicochemical Properties of Carboxymethyl Starch

**Authors :** N. Rajeswara Rao, T. Venkatappa Rao, K. Sowri Babu, N. Srinivas Rao, P. S. V. Shanmukhi

**Abstract :** Carboxymethyl Starch (CMS) is a biopolymer derived from starch by the substitution method. CMS is proclaimed to have improved physicochemical properties than native starch. The present work deals with the effect of gamma radiation on the physicochemical properties of CMS. The samples were exposed to gamma irradiation of doses 30, 60 and 90 kGy. The resultant properties were studied with electron spin resonance (ESR), fourier transform infrared spectrometer (FTIR), differential scanning calorimeter (DSC), X-ray diffractometer (XRD) and scanning electron microscopy. Irradiation of CMS by gamma rays initiates cleavage of glucosidic bonds producing different types of radicals. Some of these radicals convert to peroxy radicals by abstracting oxygen. The ESR spectrum of CMS is anisotropic and is thought to be due to the superposition of various component spectra. In order to analyze the ESR spectrum, computer simulations were also employed. ESR spectra are also recorded under different conditions like post-irradiation times, variable temperatures and saturation behavior in order to evaluate the stability of free radicals produced on irradiation. Thermal studies from DSC depict that for CMS the gelatization process was absconded at higher doses. Relative crystallinity was reduced significantly after irradiation from XRD Studies. FTIR studies also confirm the same aspect. From ESR studies, it was concluded that irradiated CMS could be a potential reference material in ESR dosimetry.

**Keywords :** gamma rays, free radicals, ESR simulations, gelatization

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