

Abstract Submitted
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Effects of Vitamin E on the Oxidative Reaction of Free Radicals in Ultra-High Molecular Weight Polyethylene¹ BENJAMIN WALTERS, MUHAMMAD JAHAN, The Univ. of Memphis, Phys Dept. — Free radicals in gamma- or x-irradiated ultra-high molecular weight polyethylene (UHMWPE) are investigated as a function of vitamin E (alpha-tocopherol (α -T)). α -T is mixed with UHMWPE (GUR 1020) powder (e-PE) before (premix) or after (post-mix) irradiation. Pre-mix powder is also compression-molded (CM) to solid pucks (1" thick and 2.5" dia.) at 200°C under constant force of 20-40 kN. Free radicals are detected using an X-band electron spin resonance (ESR) spectrometer, and oxidation index (OI) (1720 cm^{-1}) by FTIR technique. As expected, no measurable OI is detected by FTIR and thus e-PE suffers no loss in its mechanical properties. ESR data, however, suggest that α -T quenches polyethylene radicals during and/or immediately after irradiation, but it does not have any effect on the long-term oxidative reaction. The difference between the pre- and post-mix powder is apparent only at the initial stage, and the terminal oxygen-induced radicals (OIR) are produced in all irradiated samples. Both pre- and post-mix powders are found to have equal amount of residual α -T radical (tocopheroxyl).

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