dangerous. The objective of this work was to evaluate shelf-life and physical characteristics of "in natura" palm, such as color and texture, after combination of e-beam processing and refrigeration. Samples were irradiated with 0 (control), 1.0 kGy and 2.0 kGy using an electron beam irradiator (Radiation Dinamics Co. model JOB 188, New York, USA). Colour analysis results showed a significant change mainly with samples irradiated with 2.0 kGy after 14 days of storage, while non-irradiated samples and those irradiated with 1.0 kGy did not show any alteration. Similar results were obtained to texture profile, non-irradiated and 1.0 kGy samples did not differ each other, although 2.0 kGy demonstrated lower firmness.

SM/EB–14

Radiation Processing for Synthesis of Structural Materials

S. Alessi[1], P. Fuochi[2], C. Dispenza[1], D. Conduruta[1], G. Spadaro[1], and M. Lavalle[2]

[1] *University of Palermo, Palermo, Italy*
[2] *Istituto per la Sintesi Organica e la Fotoreattivitá-CNR, Bologna, Italy*

Corresponding Author: spadaro@dicpm.unipa.it

Radiation processing has given rise to more and more interest in the production of structural materials because of the several advantages that it can offer. Besides the economic considerations, concerning energy saving due to the short processing times, radiation curing provides a non thermal process way, thus reducing mechanical stresses in the final product. On the other hand epoxy resins matrices for advanced composites, used in the aerospace and automotive applications, cured by ionizing radiation, generally suffers from poor fracture toughness. This mechanical property can be enhanced by the introduction of engineering thermoplastics, but is significantly affected by the morphology and by the distribution of residual stresses in the material. Considering that radiation curing can cause an increase of temperature, due to both the exothermic polymerization reactions and the absorption of radiating energy, depending upon process and system parameters, a right choice of operating conditions has to be done in order to obtain the thermal profile which could provide the desired final properties. In this work epoxy resins toughened blends, for use as matrices for advanced composites, have been cured by electron beam with a moderate temperature profile. The samples cured in different operating conditions, including a post irradiation thermal treatment out of the mould, have been characterized in terms of both thermal behaviour by DMTA analysis and mechanical properties by fracture toughness test. The results, discussed also in the light of the morphological analysis investigated by SEM, indicate that the required properties for such applications (in terms of Tg and KIC) can be achieved by a dual cure process consisting of irradiation at moderate temperature followed by a slight thermal treatment. The use of a second treatment is needed in order to complete the cure, overcoming vitrification effects due to the low temperature during irradiation.

SM/EB–15

Effect of Electron Beam in Viscosity Properties of Inverted Liquid Sugar

P. Podadera , S.F. Sabato

IPEN – CNEN/SP, Sao Paulo, Brazil

Corresponding Author: sfsabato@ipen.br

The great advantage of inverted liquid sugar in food and pharmaceutical industries related to powder sugar is its sweetness once its main composition is a mixture of sucrose, glucose and fructose. Samples of this raw material were submitted to irradiation by an accelerator type Dynamitron-job 188, from Radiation Dynamics, Inc, at IPEN. The samples were delivered in Petri dishes with 3 mm thickness. The samples have received the following absorbed dose from the middle-energy of 1.44 MeV electron beam: 5 kGy and 10 kGy (current of 2.74 mA and dose rate of 11.19 kGy/s); 20 kGy, 30 kGy and 50 kGy (current of 5.48 mA and dose rate of 22.39 kGy/s). Viscosities were measured in a Brookfiled rheometer, model LV–DVIII, spindle SC4–34, at temperature 24.6$\pm$0.1°C.

Results confirmed the Newtonian rheological behavior of inverted liquid sugar for irradiated and control samples. Viscosity varied from 2799 ± 15 cP (for control) to 2918 ± 16 cP (for 50 kGy). Irradiated samples at 5 kGy and 10 kGy presented lower values than control, being respectively 2507 ± 18 cP, that could represent a potential break of sugar molecules. Indeed, irradiation can lead to a breakage of molecules of sucrose with release of glucose and fructose and still, the break of this monosaccharide with formation of compounds containing chains of six or less carbons. Samples irradiated at 20 kGy and 30 kGy presented viscosities close to the control ones. Samples irradiated at the higher dose obtained the highest viscosity average (2918 ± 16 cP), that could show a possible grade of polymerization. This latter became with an intense color after irradiation.

Anyway, the alterations due to irradiation were lower than the viscosity range encountered in different batches of sugar. This indicates that irradiation by electron beam did not impair the rheological properties that are essential in designing pumps, valves and equipments for processing facilities.

SM/EB–16

Changes in Physicochemical, Morphological and Thermal Properties of Electron-Beam Irradiated Ethylene–Vinyl Alcohol Copolymer (EVOH) as a Function of Radiation

B.R. Nogueira[1], V.O. Angel[2], and E.A.B. Moura[1]

[1] *Nuclear and Energy Research Institute, IPEN-CNEN/SP, São Paulo, Brazil*
[2] *Unipac Embalagens Ltda, R.A. Magniccaro, São Paulo, Brazil*

Corresponding Author: eabmoura@ipen.br

In the present work the changes in physicochemical, morphological and thermal properties of electron-beam irradiated ethylene–vinyl alcohol copolymer (EVOH) resin and EVOH resin reinforced with piassava (Attalea funifera Mart) fiber as a function of radiation dose were investigated. The EVOH resin was irradiated up to 90 kGy using a 1.5 MeV electron beam accelerator, at room temperature in presence of air. The changes in properties of the EVOH resin and of the reinforced EVOH resin after irradiation were investigated using scanning electron microscopy (SEM), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA) and sol-gel analysis. The correlation between the properties of the EVOH resin and of the EVOH resin reinforced with piassava fiber, both irradiated and non-irradiated sample, were discussed.

SM/EB–17

Radiation Induced Modification of Silica And Fillosilicates for Rubber-Fillers Composites with Enhanced Compatibility and Radical Reactivity

D. Dondi , A. Buttafava , and A. Faucitano

Department of General Chemistry University of Pavia, Pavia, Italy

Corresponding Author: Antonio.faucitano@unipv.it

Ionizing radiations have been used for modifying the surface properties of silica based fillers by grafting polybutadiene olygomers . The materials were found to have enhanced compatibility with elastomer matrices and are now being tested for sulphur and radiation induced vulcanization with the expectation of obtaining improved yield of chemically bound rubber and enhanced reinforcement mechanism. The modified silica samples were characterized by Inverse Gas chromatography (surface energy properties), granulometry, FTIR and Raman spectroscopy; the mechanism of the grafting reaction was exploited by matrix EPR spectroscopy. Under irradiation the initiating paramagnetic centres are generated prevalently within the silica matrix but rapidly migrate at the surface where the reaction with the organic coating takes place. This process is characterized by a low activation energy since experiments performed with samples irradiated at 77K and subsequent stepwise warming up to room temperature have shown that the silica species disappear giving rise to the polybutadiene crosslinking radical between 77K and 110K.