A careful dose choice and special irradiation conditions must be used in order to achieve sensory requirements needed for the commercialization of these irradiated food items.

SM/EB–08

New Applications for Accelerators in Pharmaceutical Processes

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In-line sterilization tunnels using electron beam have become a reality since the development of low energy and medium energy accelerators small enough to fit into self-shielded units which can be integrated into production lines. These systems have many advantages for the health care industry since they provide fast continuous room temperature sterilization which is simple to validate and traceable. Economies are apparent in terms of time, logistics, fixed assets costs, labour costs etc. Environmental impact is considered low. Medium energy systems for core sterilization of medical devices, syringes or vials have already been installed. The low energy surface sterilization systems which have been installed on 19+ pre-filled syringe lines have recently benefited from technology improvements which increase efficiency. The presentation will introduce electron beam sterilization technology and its practical aspects for pharmaceutical manufacturers, i.e., dosimetry, validation, interfaces, monitoring and recording.

SM/EB–12

Developments in Electron Beam Processing in Polymer and Petroleum Industries

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Recent estimates show that out of about 1400 electron accelerator units currently in use for industrial applications throughout the world, 1200 are being used for plastics and rubber processing. Commercial availability of new low, medium and high energy electron accelerators with varying powers and innovative formulations for better radiation processing of polymers have brought a synergy into electron beam processing in polymer industry. The objective of this paper is to highlight recent developments and emerging applications of radiation processing in polymer and petroleum processing technologies. The emphasis will be made on the preparation of fuel cell membranes for low temperature fuel cells, specialty adsorbents for recovery of useful metals/removal of toxic chemical species from aqueous systems, nanostructuring of surfaces for tissue engineering, modification of fluorinated polymers as solid lubricants, advanced materials for biomedical applications, composites for automotive and aviation industries and upgrading of heavy oil.

SM/EB–13

E-beam Irradiation of "In Natura" Palm: Texture and Color Evaluation

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In the last decades, palm tree (Bactris gasipaes Kunth) cultivation is gaining impetus to produce palm heart not only because its potential economic value but also due to its high mineral content. Food irradiation is a worldwide technology that aims to improve the product quality, in order to eliminate diverse microorganisms that can spoil the food. Irradiation processing, in the recommended doses, causes very few chemical alterations in foods, nutritional losses are considered insignificant and some of the alterations known found in irradiated foods is not harmful or

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

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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

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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.