Contribution ID: **188** Type: **Poster**

Simulation and Design of Electron Beam Irradiation System for Natural Rubber Vulcanization

Thursday, 25 May 2017 17:45 (15 minutes)

Electron beam irradiation can modify or improve chemical and physical properties of polymer and natural rubber. It is one of interesting and effective industrial applications of electron accelerators. This paper describes about the design of electron beam irradiation apparatus to find the efficient and convenient system for the natural rubber vulcanization. In addition, electron beam penetration dose in natural rubber latex was studied by using the Monte Carlo program GEANT4. Electron beam with different energy can penetrate deeper in the materials and give higher electron beam dose. Thus, our electron linear accelerator can produce electron beam with adjustable energy in the range of 0.5-4 MeV. The maximum electron dose at the accelerator exit is expected to be about 640 Gy. This research focuses on using program GEANT4 to simulate the electron depth dose distribution after radiating the rubber latex with electron beam. The results from simulation can be used to optimize the important parameters include both electron beam and material properties, which are electron beam energy, electron current, amount and uniformity of electron dose as well as the structure, thickness and density of material.

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Session Classification: Poster Presentation II

Track Classification: Accelerators and Synchrotron Radiations