

Characterization of Irradiation Damages to Positron Source Materials

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The secondary beam production target at future positron sources at the Continuous Electron Beam Accelerator Facility (CEBAF), the International Linear Collider (ILC) or the Future Circular Collider (FCC), feature unprecedented mechanical and thermal stresses which may compromise long term sustainable and reliable operation. Candidate materials are required to possess high melting temperature together with excellent thermal conductivity, elasticity and radiation hardness properties. In order to substantiate the material choice for the CEBAF and ILC positron sources, the response of titanium alloys, tungsten, and tantalum to an electron beam irradiation was experimentally investigated. CEBAF and ILC operating conditions were mimicked using the 3.5 MeV electron beam of the MAMI facility injector. The material damages were precisely analyzed via high energy X-ray diffraction at the HEMS beamline operated by the Helmholtz-Zentrum Hereon at the PETRA III synchrotron facility. This work reports the results of these measurements and their interpretation.

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