RaDIATE Collaboration Overview and Achievements in the last few years on Material Studies

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In the recent past, major accelerator facilities have been limited in beam power not by their accelerators, but by the beam intercepting device survivability. As next-generation accelerator target facilities (High Energy Physics, Spallation Sources, …) become increasingly more powerful and intense, high power target systems face key technical challenges. Beam-intercepting devices such as beam windows and secondary particle-production targets are continuously bombarded by high-energy high-intensity pulsed proton beams to produce secondary particles. Energy deposition from the primary beam induces near instantaneous heating (thermal shock) and microstructural changes (radiation damage) in the beam-intercepting materials. Both thermal shock and radiation damage ultimately degrade the performance and lifetime of targets and have been identified as the leading cross-cutting challenges of high-power target facilities.

In order to operate reliable beam-intercepting devices in the framework of energy and intensity increase for next generation accelerators, the RaDIATE collaboration (Radiation Damage In Accelerator Target Environment) managed by Fermilab, brings together existing expertise in nuclear material and accelerator targets from 20 international institutions to execute a coordinated strategy for high power targetry R&D. This collaboration is generating new and useful materials data for application within the accelerator and the fission/fusion communities.

I will give an overview of the RaDIATE R&D program and the achievement in the last few years on material studies in support of High Power Targetry development, including results obtained from irradiation test, development of novel materials and the prospective towards future irradiation campaign.

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