



# Ulrich Welp

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## “Pinning Landscapes for High-Performance Superconductors”

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**Thursday, June 4, 2015 – 3:30 p.m.**  
**Bldg. 241, Rm. D-172**

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New strategies to vortex pinning are required to improve the performance of superconducting materials for applications in power transmission, magnet systems and rotating machinery. Mixed pinning landscapes, that is, defect microstructures that are composed of several distinct defect types, are emerging as a promising approach for enhancing vortex pinning, particularly in high magnetic fields. Here we describe our work aimed at the controlled introduction of mixed pinning landscapes using particle irradiation. On state-of-art commercial YBCO coated conductors p-irradiation induces a near doubling of the in-field critical current density of ready-made post-production samples. TEM reveals a high concentration of uniformly distributed 2-5 nm-sized irradiation-induced defects which coexist with large rare earth oxide precipitates that appear during the conductor fabrication thus forming a novel mixed pinning landscape that is particularly effective in high applied magnetic fields. The dose dependence of the critical current enhancement at various temperatures and fields is well described in large-scale time dependent Ginzburg-Landau simulations of the vortex dynamics. More recently we have shown that irradiation with light ions, e.g., oxygen, yields a doubling of the high-field critical current of commercial YBCO coated conductors in a matter of seconds making a reel-to-reel process a viable possibility.

Light refreshments will be served 15 minutes before talk.