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Photodesorption and Photoelectron Yields from 150-nm Thin NEG Coatings

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In the FCC-ee high-luminosity collider and future high-brightness synchrotron radiation (SR) sources, the fundamental properties of Ti-Zr-V non-evaporable getter (NEG) coatings, namely, high effective pumping speeds, low photon-stimulated desorption (PSD) yields, and low total electron yields, are expected to be efficiently exploited. In such accelerators, however, stored beams are more likely to be susceptible to the resistive wall impedance generated by NEG coatings, and a standard NEG-coating thickness of 1 um may exceed the thresholds of the beam instabilities. Since reducing the film thickness limits a maximum number of venting/activation cycles due to its small bulk capacity, the NEG surface after several activation cycles can be saturated with adsorbed oxygen and carbon. Nevertheless, the vacuum systems utilizing such thin NEG coatings have a potential to perform satisfactorily if the initial PSD yields are in the same order as those of 1-um NEG coatings, i.e., 10^-5 molecules/photon; about two orders of magnitude lower than uncoated surfaces. In our experimental study, the PSD yields, as well as the photoelectron (PE) yields, from a 150-nm NEG film coated at CERN in a 1.2-m long vacuum tube are measured on an SR beamline at the KEK Photon Factory, and the aging effects on these properties through 10 venting/activation cycles are investigated. The results indicate that the PSD and PE yields are similar to those of 1-um NEG coatings up to the 10th activation cycle.

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