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The influence of post-deposition annealing on the microstructure of TiZrV non-evaporable getter coatings, their activation behaviour, and pumping speed.

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To explore the influence of activation temperatures on the operation and lifetime of non-evaporable getter coatings, films were annealed at different temperatures to monitor phase formation which was correlated with activation and pumping characteristics. TiZrV films were deposited on cylindrical stainless steel vacuum chambers, as well as oxygen-free electronic (OFE) copper and silicon substrates by magnetron sputtering of inter-twisted Ti, Zr and V elemental wire cathodes with a Kr working gas. After deposition and without venting, samples were heated to temperatures of 230 °C, 300 °C, 350 °C and 380 °C for a total of 240 hours. The resultant films on silicon substrates were examined in the scanning electron microscope for surface and cross-section morphology, energy-dispersive X-ray spectroscopy for chemical composition, and X-ray diffraction to characterise film microstructure. To monitor activation behaviour, the evolution of surface chemistry of coated OFE copper samples was monitored during an activation cycle with X-ray photoelectron spectroscopy. Pumping speed of H₂ and CO for coated stainless steel vacuum chambers was measured with a Fischer-Mommsen dome. Results indicate phase formation from higher annealing temperatures leads to delays in activation and reduced pumping speeds.

Primary author: Mr SINKOVITS, Theo (CERN)

Co-authors: Mr COSTA PINTO, Pedro (CERN); Mr SAPOUNTZIS, Antonis (CERN); Mr NEUPERT, Holger (CERN); Mr TABORELLI, Mauro (CERN)

Presenter: Mr SINKOVITS, Theo (CERN)

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