FLUX COMPARISONS BETWEEN TYPES OF X-RAY ANODES FOR HHXRF: TRANSMISSION AND REFLECTION ANODES

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Handheld XRF (HHXRF) uses small compact x-rays sources, and the x-ray sources within HHXRF devices are almost exclusively transmission anode targets. Transmission anode targets have the anode material, such a tungsten, silver, or rhodium, directly deposited in a thin film on the beryllium window. The dynamic between the tube's excitation voltage and the film thickness has a very large effect on the x-ray output of the tube. We will present the x-ray flux output vs excitation voltage for various transmission anode thicknesses and materials.

Transmission targets are primarily used in HHXRF due to physical geometry constraints as well as the desire to get the x-ray source as close to the sample as possible. In contrast, a typical x-ray tube has a 'reflection' anode which has the electron beam hit a bulk target which is separated from the x-ray window. A reflection anode is often optimized for removing heat from the anode but for low power HHXRF, removing heat from the anode is not a primary constraint.

A transmission target design is optimized when the anode layer is thick enough to stop almost all of the electrons as well as thin enough to not act as an additional x-ray filter on the x-ray tube. A fully optimized transmission anode target only applies to one voltage setting on the x-ray source, since different electron energies have different penetration depths into the anode. Because of this dynamic, Moxtek has several different types of transmission targets that are designed to fit particular applications or for a particular high voltage, on an x-ray tube. We will show the optimal flux output for a single voltage setting, as well as the flux output for non-optimal voltage settings. This will provide a compressive guide to Moxtek's anode types, and will guide users to the optimal tube anode type for given x-ray application.