

Optimization of the thickness for target materials for the transmission type X-ray tube

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Transmission type X-ray tubes are used for ionizers, dental X-ray imaging equipment and portable or bench-top XRF equipment. The radiation intensity will be decided by several important parameters which are tube voltage, current, target material and thickness. Target material and thickness are the most major parameters for transmission type X-ray tubes. In a transmission target, the amount of X-rays produced will be increased by increasing thickness of the targets but the amount of self-absorption will be also increased. However, thinner thickness of a target cannot be gotten enough interaction between electrons and a target. Therefore, it is important to determine an optimum thickness of the target.

First, The target material depends on XRF applications. Mainly tungsten (W), Silver (Ag), Rhodium (Rh), Molybdenum (Mo), Copper (Cu), and Chromium (Cr) are used as target materials. The X-ray flux was simulated to each target materials by 5Kv to 60Kv tube voltage using MCNPX code. As a result, we drove the relational-expression between the tube voltage and the target thickness. Second, The tungsten target was doped on the beryllium window using a PVD equipment. The coating thickness was measured using a thickness gauge. The X-ray tube was manufactured by the brazing facilities in our company. We measured the radiation dose values by changing tube voltages and coating thickness.

Finally, the dose rates were measured by changing tube voltages and coating thickness and the experiment and simulation results were comparative analyzed. The relational-expression between a tube voltage and target thickness will be useful data in determine of target thickness.

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