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Unusual electron emission characteristics of CeB6 cathodes

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Thermionic electron guns that use borides of lanthanum or cerium as the electron emission surface are widely adopted for electron microscopes due to their high brightness. CeB6 cathodes are known for their high environmental durability and can be used up to a vacuum pressure of $1e-6$ Pa. At MHI-MS, our company, we also adopt CeB6 cathodes in the C-band compact accelerating structure units we manufacture, and we have shipped dozens of units so far.

As for the cathode assembly, we purchase Vogel-type cathodes and incorporate them into the thermionic electron guns. Before shipping, we bake the entire accelerating structure, including the electron gun, and confirm the electron emission characteristics. Recently, some of the procured cathodes have exhibited abnormal behavior, such as a decrease in electron emission as the vacuum pressure of the electron gun decreases. Analysis of the CeB6 crystal shows no significant differences between the normal and abnormal batches, and the cause is still unknown.

Footnotes

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