Contribution ID: **14** Type: **Oral**

THE SWITCH-ON MECHANISM OF THE CURRENT EMISSION

Thursday, 22 September 2022 11:30 (30 minutes)

The Switch-On effect of the current emission is known since long time. This effect is usually attributed to the existence of a Switch-On Voltage, after which the electrodes in the vacuum switch from a non-conductive to a conductive condition. Once reached the Switch-On Voltage the changes in the electrodes are permanent and the electric current can be measured even at lower voltages. In our experiments we find that when a constant electric field, not too intense (≤40 kV/mm), is applied to smoothed, unconditioned new brand electrodes, the current output is initially negligible (certainly below our current measurement sensitivity $\approx 10^{-9} A$). After a long-lasting (in the order of tenths of hours) constant dc voltage has been applied, a sudden increase in current is observed. By then decreasing and/or increasing the voltage around the constant value, we found regular and reversible Fowler-Nordheim type diagrams. These transitions are interpreted as changes in the electrode surface structure. Our research aims to characterize these transitions (transition time, current and voltage levels) for electrodes made of different materials and/or with different surface treatments. Considerations are finally exposed to explain this Switch-On effect as a consequence of the accumulation of electric charge at the metal-insulator cathode interface.

Topic

Field Emission

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Session Classification: Field Emission

Track Classification: Field emission