

Introduction

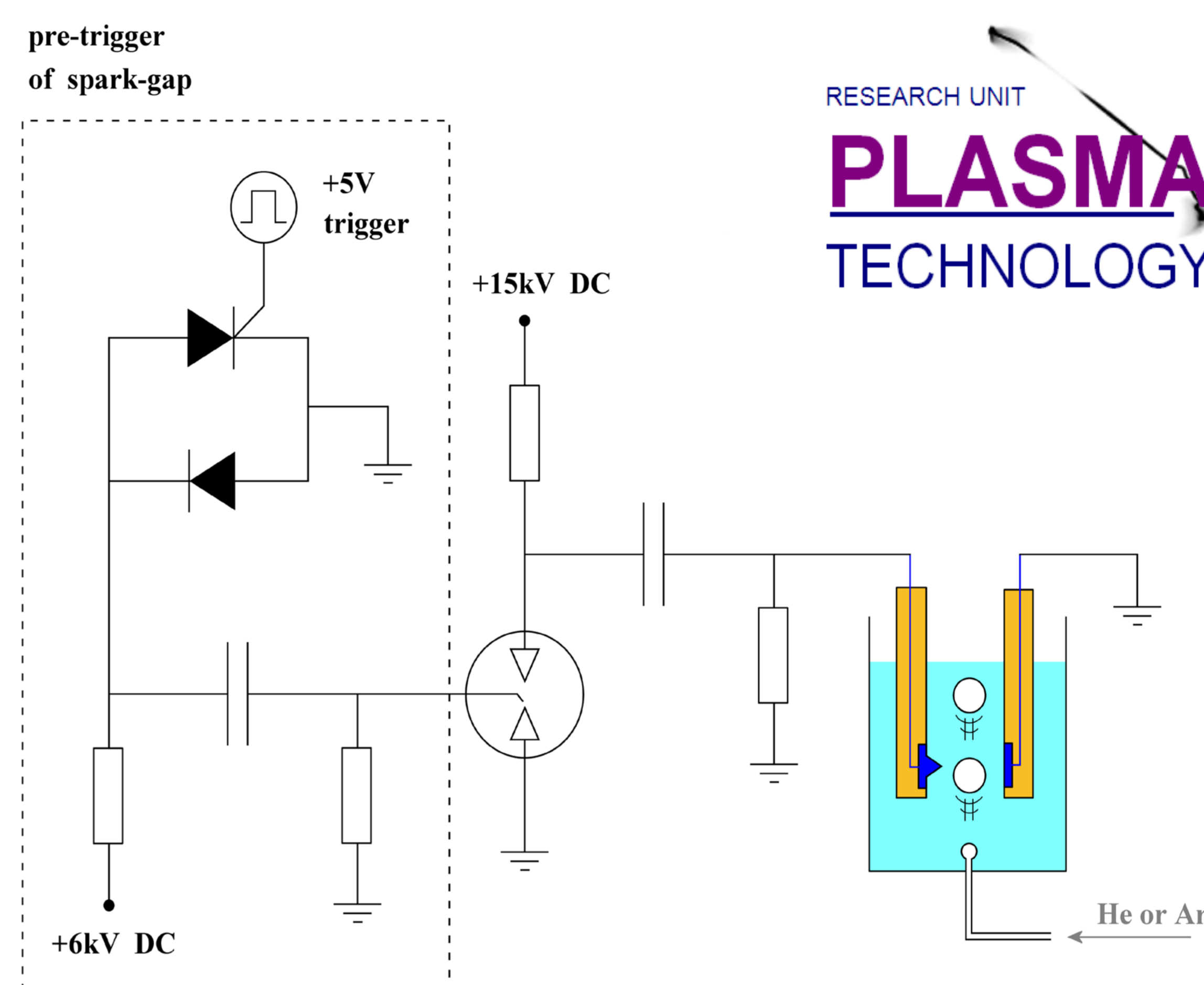
Plasma discharges inside gas or vapour bubbles in water have been proposed in the last decade as a new and effective method of water treatment. However, the fundamental nature of bubble discharge is still poorly understood. The investigation of plasma discharge in single gas bubbles is necessary to fill this lack of insight.

Experimental set-up

A pre-triggered spark-gap was used to generate high voltage pulses with rise times below 10 ns.

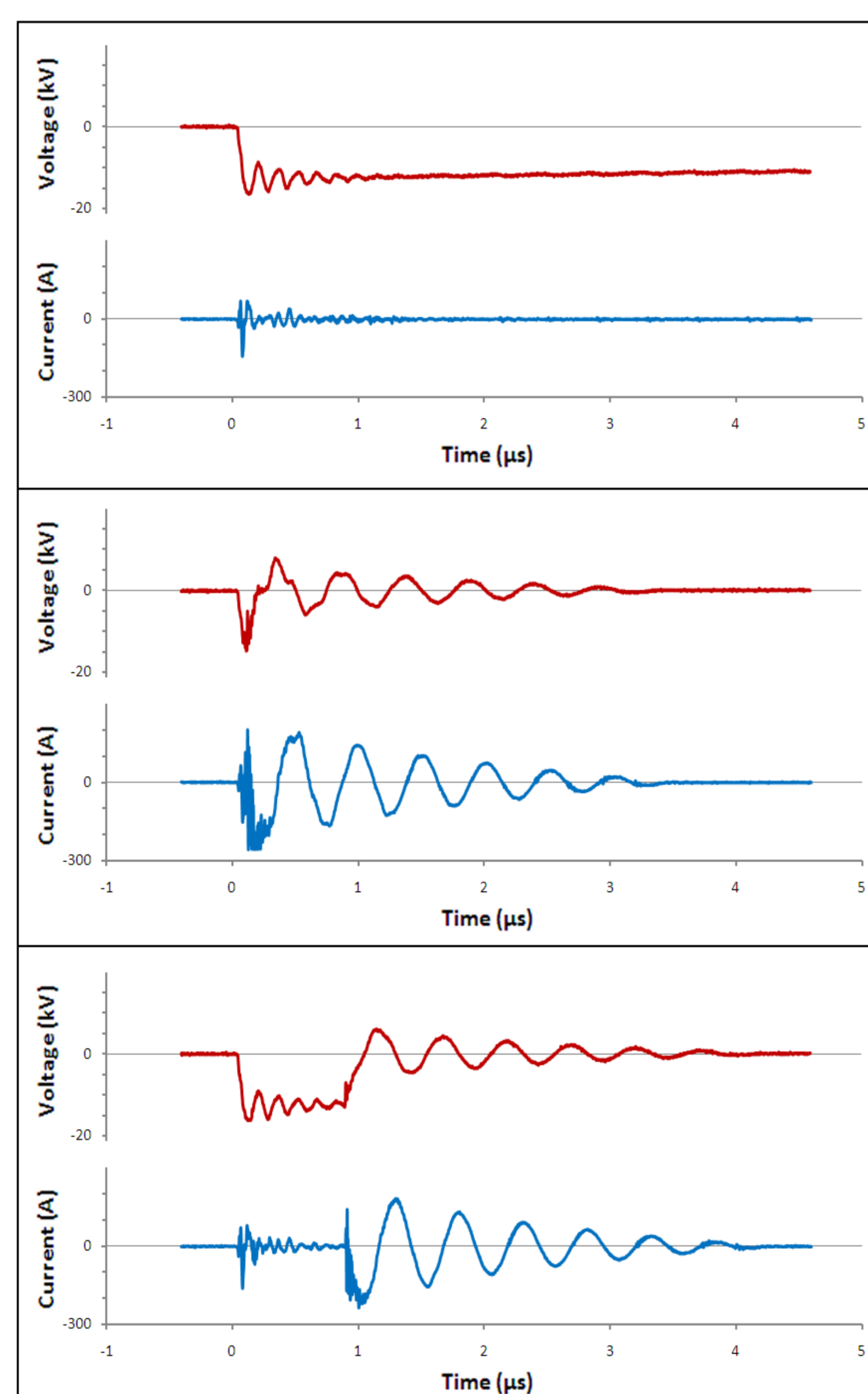
The bubbling gas is injected in the water through a capillary with a flow rate as low as 30 sccm.

The bubbles are estimated to be slightly smaller than the distance between the electrodes, i.e. 2 mm.



Scheme of experimental set-up with RUPT logo.

Electrical characterization



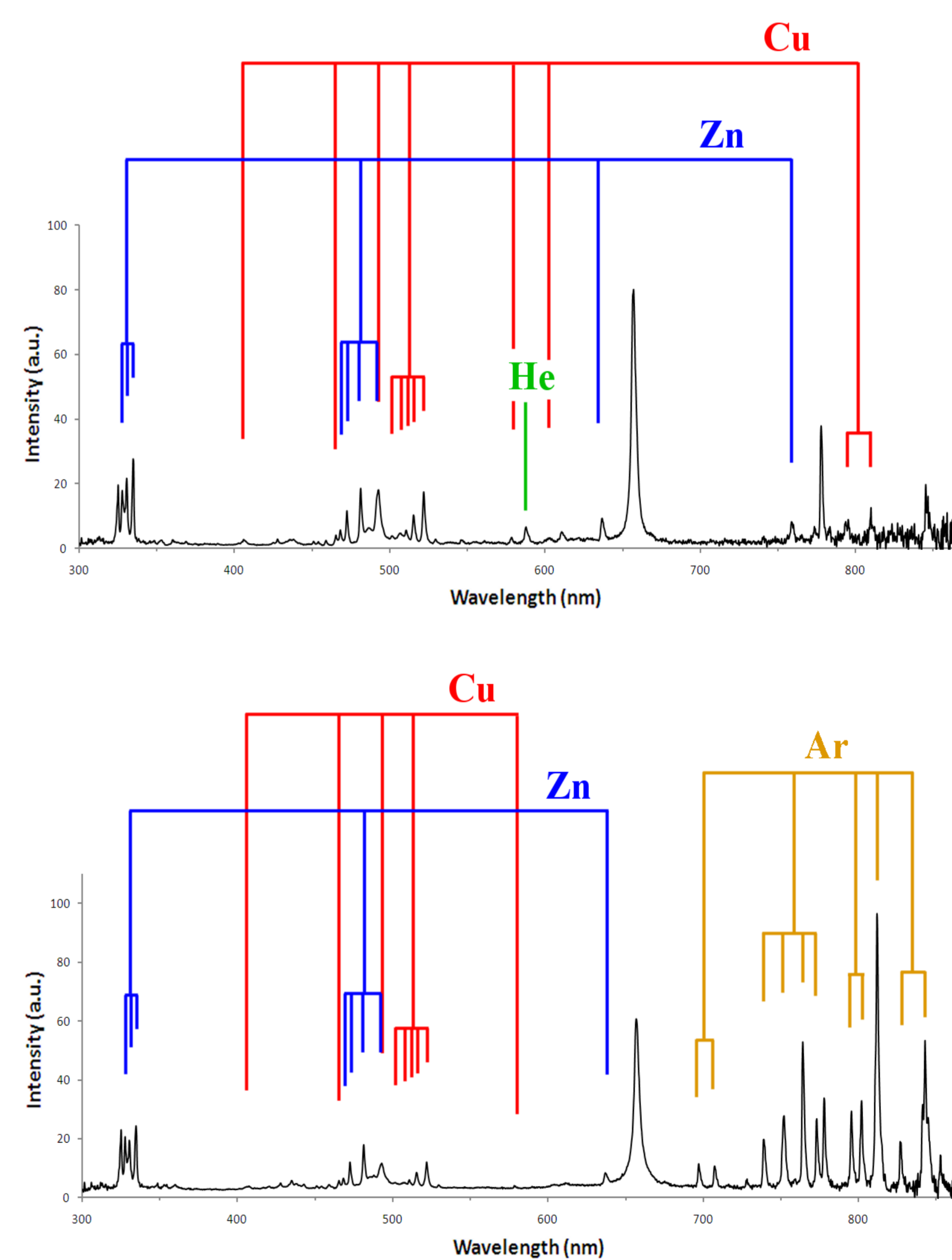
Electrical waveforms measured for HV-pulses of 15 kV applied to helium bubbles.

Discharge without bubbling

Direct spark discharge in bubble

Delayed spark discharge in bubble

Spectral characterization



Spectrum of direct discharge inside a helium (top) or argon (bottom) bubble measured for HV-pulses of 15 kV.

Two types of bubble discharge are observed. The occurrence of each discharge type is believed to be dependent on the vertical bubble position at the moment of discharge.

Conclusion

Zinc and copper lines dominate the bubble discharge spectrum. Both metals originate from the messing electrodes.