

Deformations of Soap Bubbles in a Uniform Electric Field



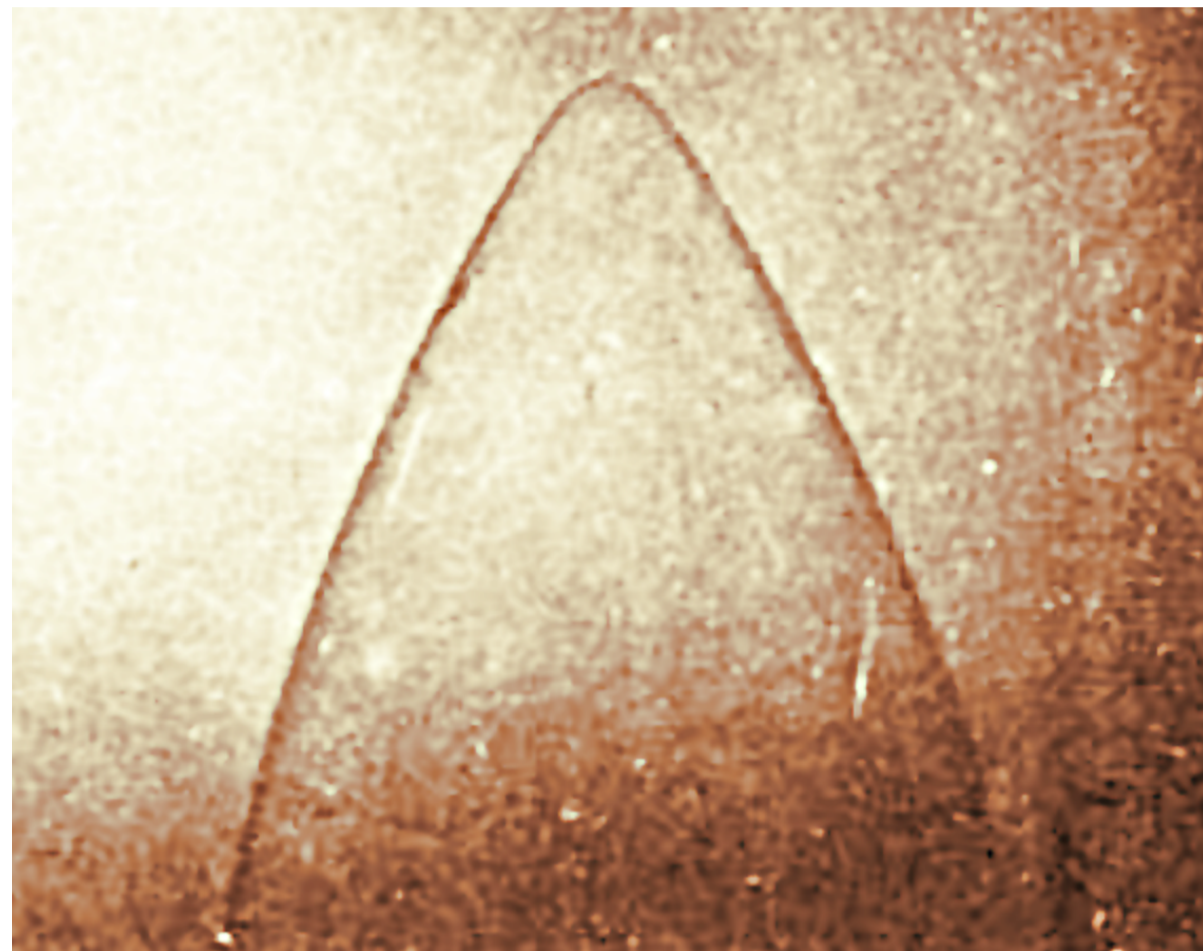
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Context

Taylor (1925) [1]

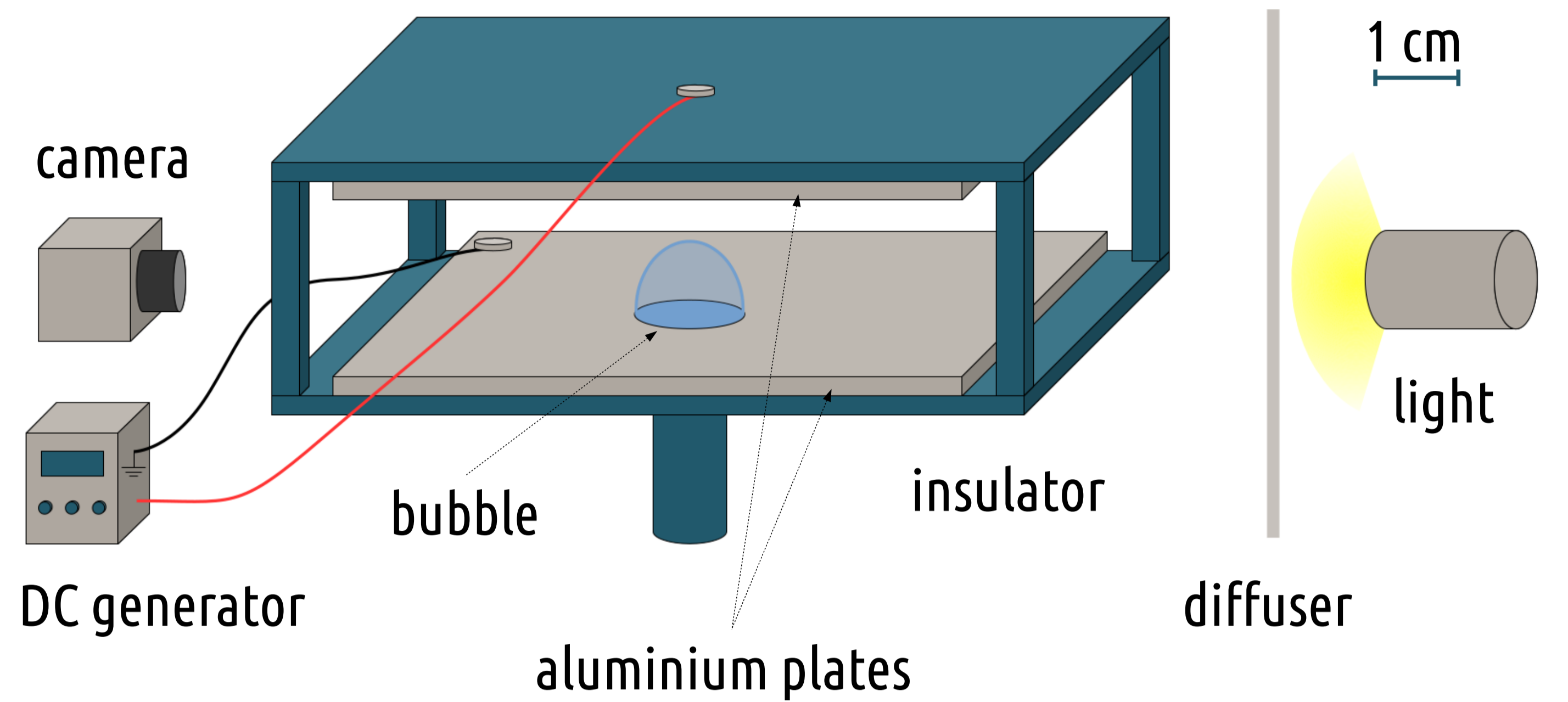


Study of bubble deformations under the Taylor's cone threshold.

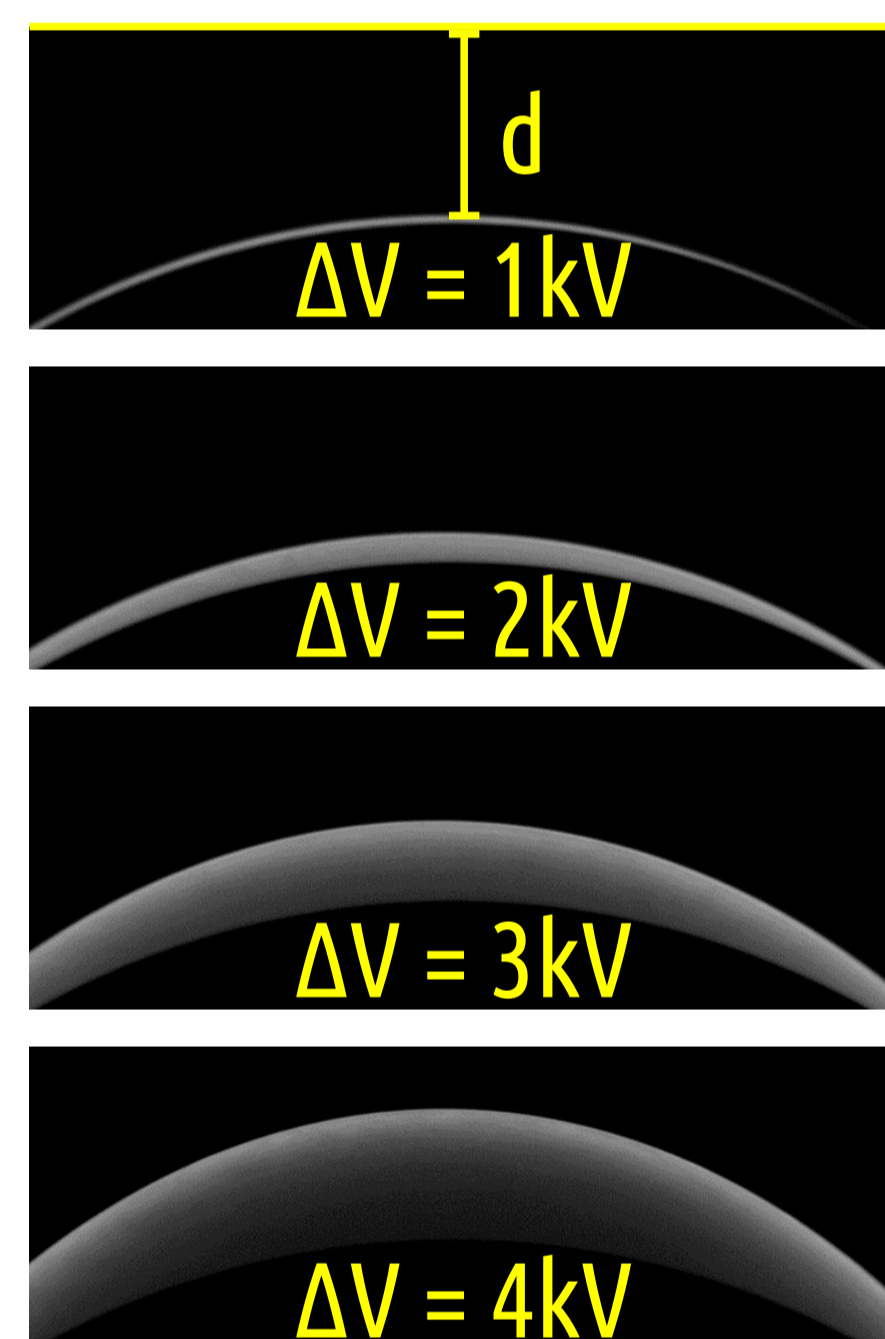
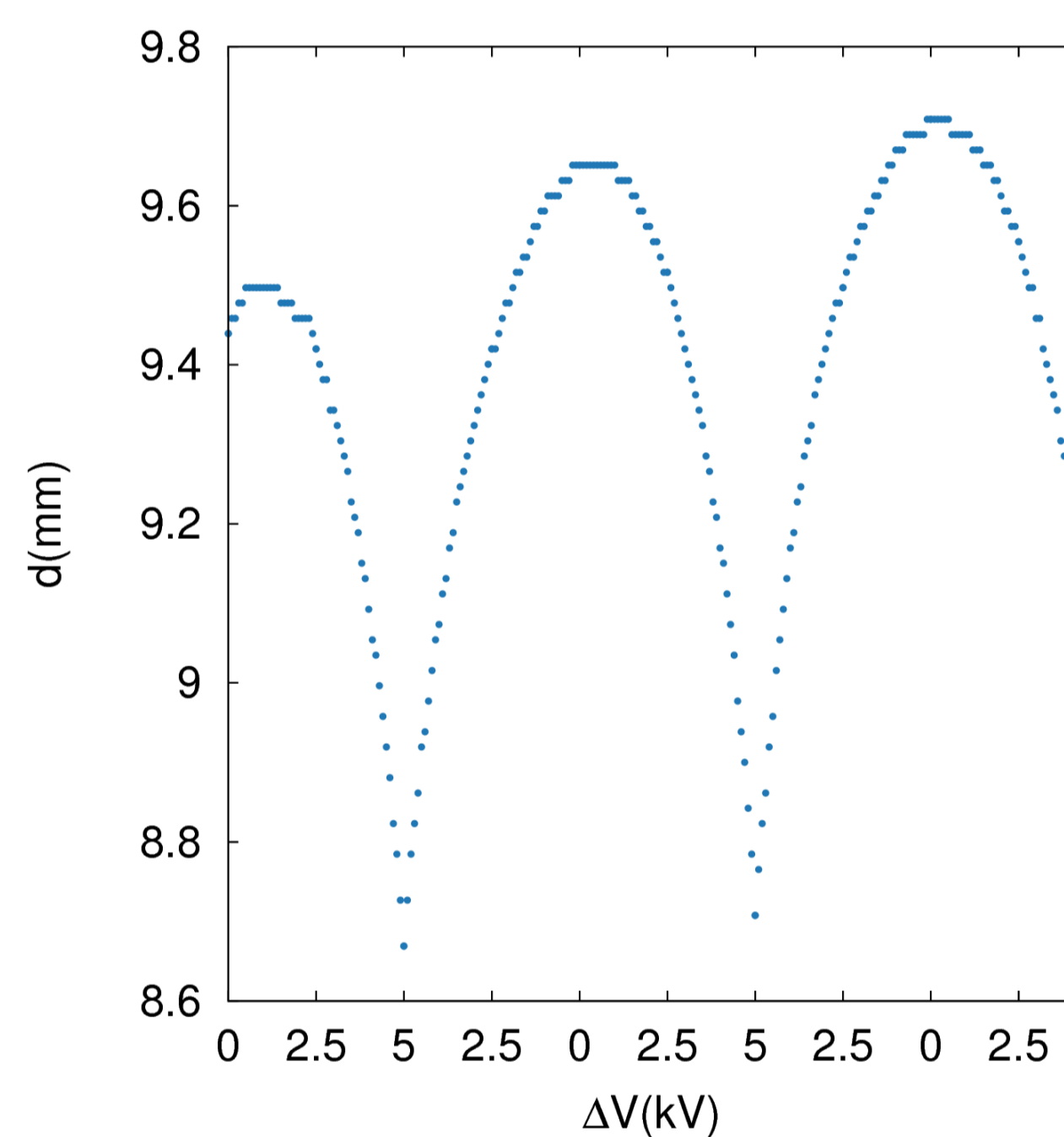
Present studies



Experimental device



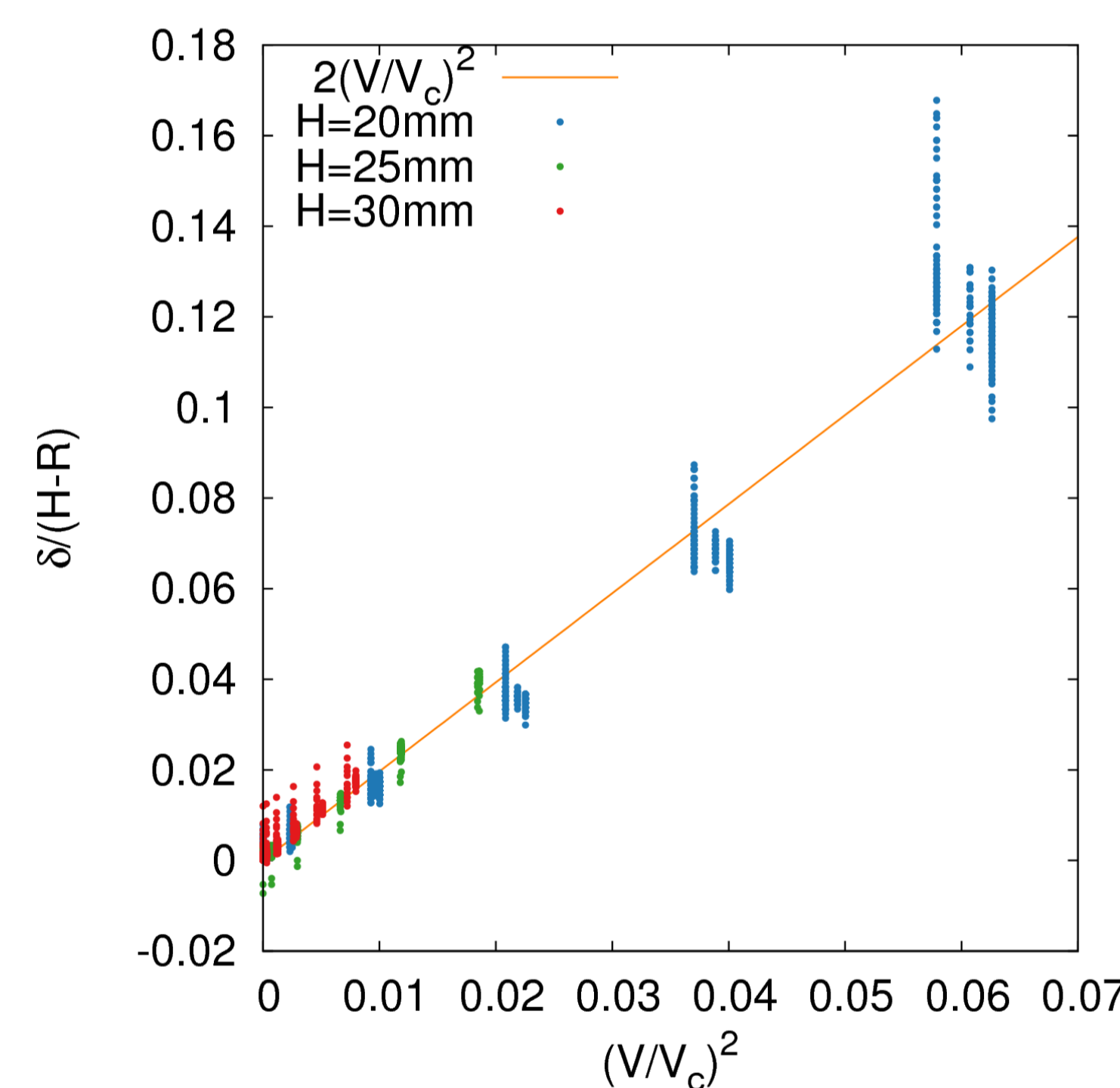
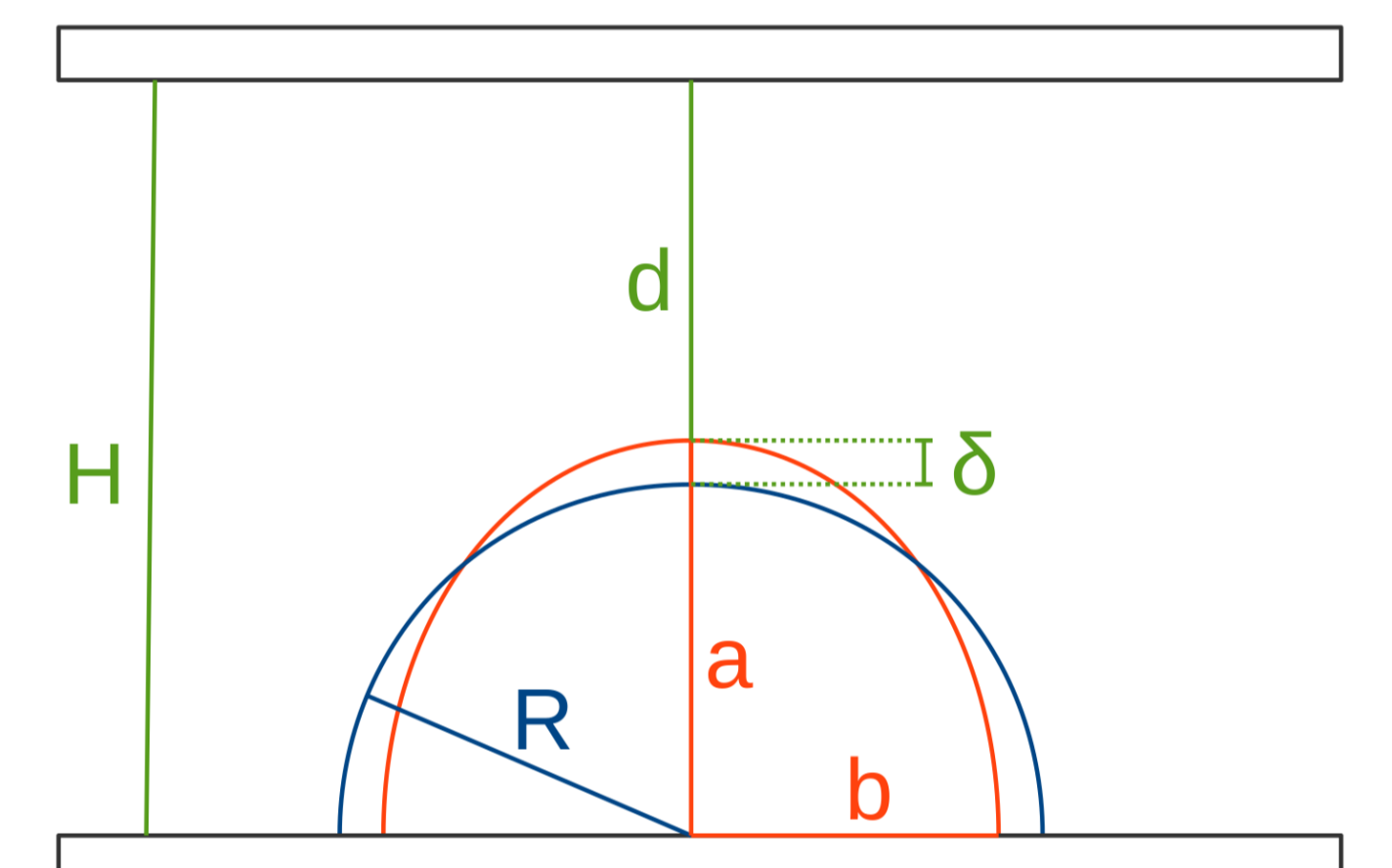
Deformation cycles



Scaling law

Equation based on the competition between **surface tension** and **electrical field**.

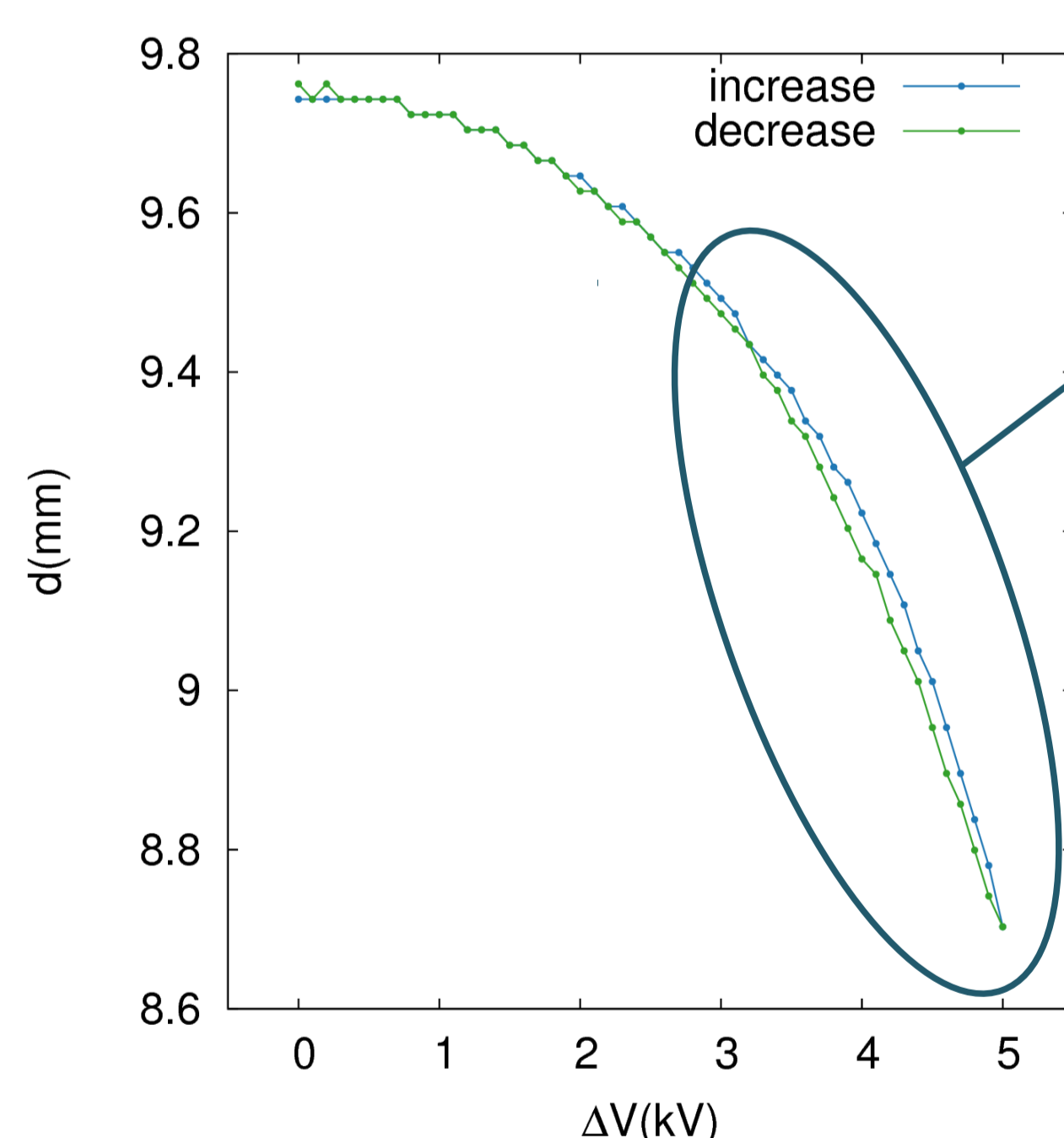
$$4\gamma \frac{a}{b^2} = \Delta p + \frac{1}{2} \epsilon_0 \frac{V^2}{d^2}$$



$$\delta = \frac{1}{16} \frac{\epsilon_0 R^2}{\gamma (H-R)^2} V^2$$

$$V_c = \sqrt{16 \frac{\gamma (H-R)^3}{\epsilon_0 R^2}}$$

Hysteresis loop



Appearance of an hysteresis loop



Hysteresis due to the movement of the contact line?

Conclusion

We obtain a **scaling law** in good agreement with the experimental measures.

We need to investigate the effect movement of the **triple line** on the bubble deformation.



Reference

[1] TCR. Wilson, G. Taylor, *The bursting of soap-bubbles in a uniform electric Field*, Math. Proc. Camb. Phil. Soc. **22**, 728 (1925).



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