Big Bang Pickle

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It is well known that pickles connected to DC voltage light up on the negatively charged electrode. We expected that performing the experiment with AC voltage would result in the pickle glowing at both sides because of the permanently changing flow direction of the current. Surprisingly, the pickle did only light up unilaterally. Looking at high-speed footage reveals that the glowing side only glows when the according electrode is negatively charged thus 50 times per second (50 Hz) matching the frequency of the used mains voltage (230 V). The other side did not glow even though it was temporarily negatively charged. Using a model system based on a NaCl-solution, we could eliminate all biological factors. According to our hypothesis, the electrodes need to reach a certain temperature (approx. 100 °C) to start the glowing process. In conformity with the law of current and warming, the higher-resistance electrode warms up faster and thus starts to glow first. Our data suggests that as soon as the glowing process starts, the current decreases wherewith the less-resistance electrode is not able to reach the critical temperature. We performed several experiments to testify our hypothesis. Furthermore, a spectroscopic measurement shows that sodium atoms emit the yellow light we observed. A possible explanation is that a gas discharge in a thin steam layer around the electrode is the physical mechanism that stimulates these atoms. Even though we did not focus on developing a product as the result of our research, we detected a potential technical application.

Awards Won:
Coalition for Plasma Science (CPS): First Award of 2,500.00