Discharge modes in oil submerged spark gap with gas injection.
KUNPENG WANG, XIN TANG, DAVID STAACK\textsuperscript{1}, Texas AM University —
Electrical discharge in submerged spark gap with gas injection was experimentally
studied with two different commonly used electric circuits. One RC circuit with
constant voltage and a double spark gap circuit were used. The charging time of
the RC circuit before breakdown was comparable with the bubble residence time in
the spark gap, while the second circuit with double spark gap finished charging and
discharging on the second capacitor two orders of magnitude faster than the bubble
rising time. Consequently, bubble dynamics are relatively independent of the applied
electric field if we use the second circuit. Three different discharge mechanisms were
proposed. The first breakdown mechanism is believed to happen in the gas phase
only when the entire spark gap was enclosed in a gas bubble. Breakdown occurs
first on the electrode tips where a stronger electric field is present. The second
discharge mechanism is initiated by contaminates in the liquid. When contaminates
get charged from one electrode and move in the electric field towards the second
electrode, breakdown happens during this process. The third discharge mechanism
we proposed is due to the interactions between either charged bubbles or charged
bubbles and electrode.

\textsuperscript{1}Dr. David Staack is the corresponding author of this publication