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Abstract

Nuclear energy's potential to reduce greenhouse gas emissions from electricity generation is currently under debate. To better understand the inner dynamics nuclear power plant, pool boiling and platinum wire were used to model water cooling of nuclear fuel cladding and burnout phenomenon. Joule heating was used to generate and measure heat transfer rate from a platinum wire inside a pressurized vessel of water. Voltage, current, and duration were varied to achieve transient boiling along a wire of approximately 10 mm in length. A slow-motion camera was utilized to capture images of the resulting bubbles during the pulse and temperature, voltage, and current data was collected and analyzed to produce boiling curves of transient boiling behavior. These measurements indicated that the heat transfer rate was positively correlated with increased pressure. These experiential learning project and results contributed to a better understanding of the heat transfer rate inside a nuclear reactor and further comprehension of safe nuclear power plant design.