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## **Needle shaped conductivity probes with integrated micro-thermocouple and their application in rapid condensation experiments with non-condensable gases**

### **Abstract**

The present paper deals with advanced conductivity probes for local void measurements, which were equipped with a micro-thermocouple, which is integrated into the probe at the place of the electrode wire. These probes were used for rapid transient condensation tests in a heat exchanger pipe immersed into a cooling water tank. The experiments serve as data sources for the validation of thermal-hydraulic system codes concerning the modelling of the condensation, particularly with respect to the behaviour and effect of non-condensable gases. The present tests were carried out at the pressurizer test facility DHVA of the University for Applied Sciences in Zittau/Görlitz serving as steam source. The slightly downwards inclined condensation tube was connected to the head of the pressure vessel and supplied with steam in this way. The application of a new type of two-phase instrumentation has revealed details about the transient condensation process. Since tests were performed with and without the presence of a non-condensable gas (air), the effect of the gas could be studied. The merits of the probes lie in the ability to distinguish between steam and gas. Without the synchronous temperature and void measurement performed by the probes it would have not been possible to clarify the physical background of the temperature jumps found during the experiments with the non-condensable gas.

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