Infrared thermography based fuel film investigations

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Abstract

In this paper we present an infrared thermography based method for systematic studies of the temporal and spatially resolved heat fluxes during the whole process of spray impingement to film evaporation. This is mainly possible due to new developments in infrared camera technology. The influence of three test parameters was examined - the injector position, the injection pressure and the wall temperature.

In DI-engines fuel wall films are an important origin of soot particles. In order to reduce fuel wetting a detailed analysis of wall film forming is necessary. The strong influence of the surface temperature on the droplet-wall interaction and the resulting liquid deposition is known. But the quantitative forecast of wall films caused by dense sprays is usually poor because of the various parameters influencing the occurring heat fluxes which reduce the surface temperature during the injection.

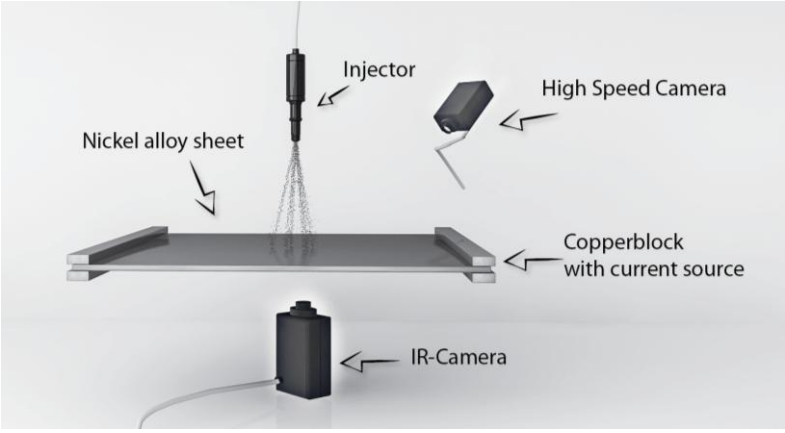

Figure 1 Schematic experimental setup

The maximum temperature decrease is sensitive to all three test parameters. The overall heat inserted into the fuel is almost independent of the distance between injector and wall. Contrary to the first guess that the spray impact takes more energy out of the wall than the following film evaporation, it can be shown that underneath the Nukiyama-Temperature the film evaporation needs up to 15 times the heat used during the spray-wall interaction.

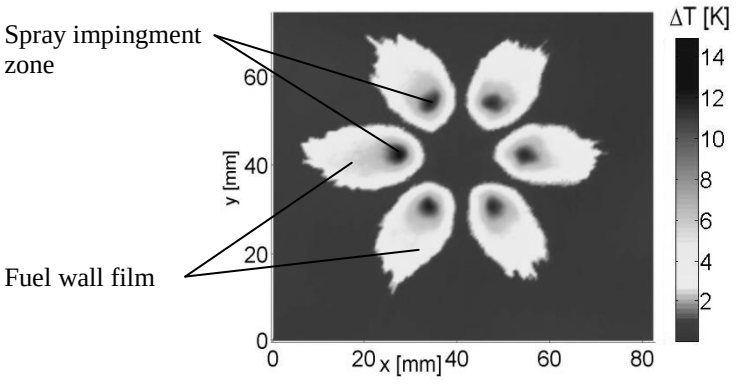

Figure 2 Field of temperature-differences of the fuel wall film caused by a six hole nozzle

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