Proceedings of the 5th h World Congress on Momentum, Heat and Mass Transfer (MHMT'20)
~~Lisbon, Portugal~~ Virtual Congress – October 2020
Paper No. ENFHT 166
DOI: 10.11159/enfht20.166

Investigating the influence of macroscopic surface structures on the thermal contact conductance using infrared thermography

Thorsten Helmig, Michael Burghold, Faruk Al-Sibai, Reinhold Kneer
Institute of Heat and Mass Transfer, RWTH Aachen University
Augustinerbach 6, 52062 Aachen, Germany
helmig@wsa.rwth-aachen.de

Abstract **-** The prediction of thermal contact conductance is commonly based on surface parameters such as roughness or mean slope. However, these parameters do not consider the orientation of macroscopic surface structures in contact, although this parameter may have a significant influence on the thermal contact conductance. To investigate this effect, three sets of specimens with different orientation of macroscopic surface structures are manufactured, all revealing the same roughness and mean slope. To quantify the thermal contact conductance, an infrared-camera measures the transient temperature response of two heated specimens pressed together by a hydraulic test bench. The obtained temperature data are then used as input for a conjugate gradient method quantifying the time-dependent thermal contact conductance. The results yield that specimen sets offering a conforming contact interface exhibit the highest conductance but show at the same time the highest standard deviation. In contrast, non-conforming contacts reveal both, lower mean values and standard deviation, the latter leading to less uncertainty in predicting thermal contact conductance. With the outlined findings, distinct surface structures can be chosen in order to achieve a desired range of thermal characteristics.

Keywords**:** Thermal Contact Conductance, macroscopic surface structures, IR-thermography, Inverse heat conduction problem**.**