

Experimental Study on Thermal Conductivity of Skin Tissue Based on a One-Side Measurement Method

Yan-Feng Wang^{C, S} and Jiang-Tao Wu

MOE Key Laboratory of Thermo-Fluid Science and Engineering, School of Energy and Power Engineering, Xi'an Jiaotong University, Xi'an, Shaanxi, China
yfw112@xjtu.edu.cn

Incorporation of experimental investigation into a one-side measurement method has been proven highly significant in determining thermal conductivity of skin tissue. First, a mathematical model was systematically developed in order to describe the basic principle of measurement in theory. Second, a MATLAB-based solving algorithm subject to the above measurement model was programmed. Third, a corrected correlation between thermal conductivity and temperatures measured directly was strictly explored with abundant experimental data analyzed scientifically via the MATLAB-based solving algorithm. Consequently, it is indicated that a strong dependence on contact thermal resistance exists for the measurement uncertainty of thermal conductivity regarding tested samples made of skin tissue. Moreover, individual variation about skin tissue exhibits an obvious influence on measurement uncertainty of thermal conductivity as well. Last but not the least, a flexible and non-destructive measurement of thermal conductivity of skin tissue, even on-body skin tissue, is becoming practical in technology due to this research work. In general, the proposed one-side measurement approach provides some new insights into determining thermal conductivity of skin tissue, as well as its uncertainty is in good agreement with the open literature data under relatively controllable contact thermal resistance.