

TITLE: Multiphysics Modeling and Prototyping of a Wearable Sensor for Sweat Rate Measurements.

ABSTRACT: Sweat analysis has gained remarkable interest as a non-invasive tool for the assessment of stress and dehydration that athletes and workers can experience under strenuous conditions. A measurement of the sweat rate can be produced from the gradients of humidity and temperature observed on the vicinity of the skin recorded by wearable sensors. Nevertheless, the evaporation of sweat from the skin surface is largely influenced by ambient factors such as the ambience temperature and humidity, as well as the air flows around the measuring device. This work presents a multiphysics model describing the effect of air speed and ambient humidity on an open chamber based sweat rate sensor, to be later validated by experiments on a wearable sensor prototype. Results of simulations allow to predict operations ranges, so that interferences from ambient conditions on the measurements at the sweat rate sensor prototype can be minimized.

AUTHORS: Jorge Prada*, Federico Vivaldi*, Andrea Bonini*, Antonio Lanatà†, Emilio Franchi‡, Fabio Di Francesco*.

* Department of Chemistry and Industrial Chemistry, University of Pisa, Italy.

† Department of Information Engineering, University of Florence, Italy

‡ Research and Development, R.i.CO.srl, Navacchio, Italy