Document Title: 14542-01 LIT, Methods for Measuring Thermal Properties		Part # 14542-01	
		Release Date: 8/14/12	
Rev.	Description	Revision By	Date

Production Filename: 14542-01 LIT, Methods for Measuring Thermal Properties

Path to Working Files: Decadoc\Video Transcriptions\Master\Thermal Properties \14542-01 LIT, Methods for Measuring Thermal Properties

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

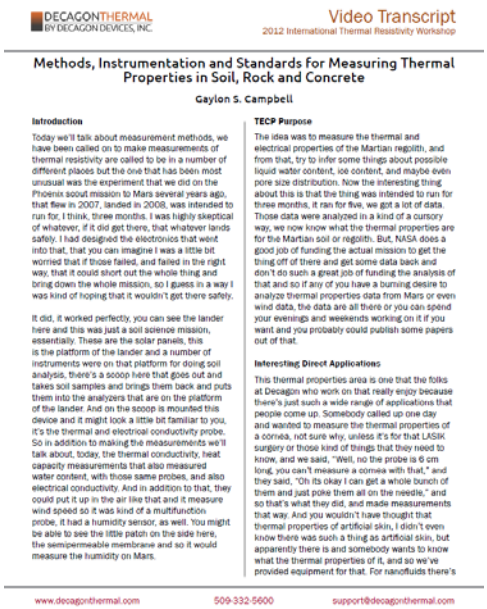
Colors: Color Print on White

Printer: HP Color LaserJet 5550

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale **



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Video Transcript
2012 International Thermal Resistivity Workshop

Methods, Instrumentation and Standards for Measuring Thermal Properties in Soil, Rock and Concrete

Gaylon S. Campbell

Introduction

Today we'll talk about measurement methods, we have been called on to make measurements of thermal resistivity are called to be in a number of different places but the one that has been most unusual was the experiment that we did on the Phoenix scout mission to Mars several years ago, that flew in 2007, landed in 2008, was intended to run for, I think, three months. I was highly skeptical of whatever, if it did get there, that whatever lands safely. I had designed the electronics that went into that, that you can imagine I was a little bit worried that if those failed, and failed in the right way, that it could short out the whole thing and bring down the whole mission, so I guess in a way I was kind of hoping that it wouldn't get there safely.

It did, it worked perfectly, you can see the lander here and this was just a soil science mission, essentially. These are the solar panels, this is the platform of the lander and a number of instruments were on that platform for doing soil analysis, there's a scoop here that goes out and takes soil samples and brings them back and puts them into the analyzers that are on the platform of the lander. And on the scoop is mounted this device and it might look a little bit familiar to you, it's the thermal and electrical conductivity probe. So in addition to making the measurements we'll talk about, today, the thermal conductivity, heat capacity measurements that also measured water content, with those same probes, and also electrical conductivity. And in addition to that, they could put it up in the air like that and it measure wind speed so it was kind of a multifunction probe, it had a humidity sensor, as well. You might be able to see the little patch on the side here, the semipermeable membrane and so it would measure the humidity on Mars.

TECP Purpose

The idea was to measure the thermal and electrical properties of the Martian regolith, and from that, try to infer some things about possible liquid water content, ice content, and maybe even pore size distribution. Now the interesting thing about this is that the thing was intended to run for three months, it ran for five, we got a lot of data. Those data were analyzed in a kind of a cursory way, we now know what the thermal properties are for the Martian soil or regolith. But, NASA does a good job of funding the actual mission to get the thing off of there and get some data back and don't do such a great job of funding the analysis of that and so if any of you have a burning desire to analyze thermal properties data from Mars or even wind data, the data are all there or you can spend your evenings and weekends working on it if you want and you probably could publish some papers out of that.

Interesting Direct Applications

This thermal properties area is one that the folks at Decagon who work on that really enjoy because there's just such a wide range of applications that people come up. Somebody called up one day and wanted to measure the thermal properties of a cornea, not sure why, unless it's for that LASIK surgery or those kind of things that they need to know, and we said, "Well, no the probe is 6 cm long, you can't measure a cornea with that," and they said, "Oh its okay I can get a whole bunch of them and just poke them all on the needle," and so that's what they did, and made measurements that way. And you wouldn't have thought that thermal properties of artificial skin, I didn't even know there was such a thing as artificial skin, but apparently there is and somebody wants to know what the thermal properties of it, and so we've provided equipment for that. For nanofluids there's

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