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Nota di contenuto	EXPERIMENTAL MICRO/NANOSCALE THERMAL TRANSPORT; CONTENTS; PREFACE; 1 INTRODUCTION; 1.1 Unique Feature of Thermal Transport in Nanoscale and Nanostructured Materials; 1.1.1 Thermal Transport Constrained by Material Size; 1.1.2 Thermal Transport Constrained by Time; 1.1.3 Thermal Transport Constrained by the Size of Physical Process; 1.2 Molecular Dynamics Simulation of Thermal Transport at Micro/Nanoscales; 1.2.1 Equilibrium MD Prediction of Thermal Conductivity; 1.2.2 Nonequilibrium MD Study of Thermal Transport; 1.2.3 MD Study of Thermal Transport Constrained by Time 1.3 Boltzmann Transportation Equation for Thermal Transport Study1.4 Direct Energy Carrier Relaxation Tracking (DECRT); 1.5 Challenges in Characterizing Thermal Transport at Micro/Nanoscales; References; 2 THERMAL CHARACTERIZATION IN FREQUENCY DOMAIN; 2.1 Frequency Domain Photoacoustic (PA) Technique; 2.1.1 Physical Model; 2.1.2 Experimental Details; 2.1.3 PA Measurement of Films and Bulk

Materials; 2.1.4 Uncertainty of the PA Measurement; 2.2 Frequency Domain Photothermal Radiation (PTR) Technique; 2.2.1 Experimental Details of the PTR Technique
2.2.2 PTR Measurement of Micrometer-Thick Films2.2.3 PTR with Internal Heating of Desired Locations; 2.3 Three-Omega Technique; 2.3.1 Physical Model of the 3u Technique for One-Dimensional Structures; 2.3.2 Experimental Details; 2.3.3 Calibration of the Experiment; 2.3.4 Measurement of Micrometer-Thick Wires; 2.3.5 Effect of Radiation on Measurement Result; 2.4 Optical Heating Electrical Thermal Sensing (OHETS) Technique; 2.4.1 Experimental Principle and Physical Model; 2.4.2 Effect of Nonuniform Distribution of Laser Beam; 2.4.3 Experimental Details and Calibration
2.4.4 Measurement of Electrically Conductive Wires2.4.5 Measurement of Nonconductive Wires; 2.4.6 Effect of Au Coating on Measurement; 2.4.7 Temperature Rise in the OHETS Experiment; 2.5 Comparison Among the Techniques; References; 3 TRANSIENT TECHNOLOGIES IN THE TIME DOMAIN; 3.1 Transient Photo-Electro-Thermal (TPET) Technique; 3.1.1 Experimental Principles; 3.1.2 Physical Model Development; 3.1.3 Effect of Nonuniform Distribution and Finite Rising Time of the Laser Beam; 3.1.4 Experimental Setup; 3.1.5 Technique Validation; 3.1.6 Thermal Characterization of SWCNT Bundles and Cloth Fibers
3.2 Transient Electrothermal (TET) Technique3.2.1 Physical Principles of the TET Technique; 3.2.2 Methods for Data Analysis to Determine the Thermal Diffusivity; 3.2.3 Effect of Nonconstant Electrical Heating; 3.2.4 Experimental Details; 3.2.5 Technique Validation; 3.2.6 Measurement of SWCNT Bundles; 3.2.7 Measurement of Polyester Fibers; 3.2.8 Measurement of Micro/Submicroscale Polyacrylonitrile Wires; 3.3 Pulsed Laser-Assisted Thermal Relaxation Technique; 3.3.1 Experimental Principles; 3.3.2 Physical Model for the PLTR Technique; 3.3.3 Methods to Determine the Thermal Diffusivity
3.3.4 Experimental Setup and Technique Validation

Sommario/riassunto

"This book covers the new technologies on micro/nanoscale thermal characterization developed in the Micro/Nanoscale Thermal Science Laboratory led by Dr. Xinwei Wang. Five new non-contact and non-destructive technologies are introduced: optical heating and electrical sensing technique, transient electro-thermal technique, transient photo-electro-thermal technique, pulsed laser-assisted thermal relaxation technique, and steady-state electro-Raman-thermal technique. These techniques feature significantly improved ease of implementation, super signal-to-noise ratio, and have the capacity of measuring the thermal conductivity/diffusivity of various one-dimensional structures from dielectric, semiconductive, to metallic materials"--