NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

PAP Seminar Announcement

1. Nonresonant physical processes

By

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Date: 15 October 2018 (Monday)
Time: 4.30 pm - 5.30 pm
Venue: MAS Executive Classroom 1 (SPMS-MAS-03-06)
Host: Assoc Prof. Cesare Soci

Abstract

In this talk, introduction to absorption of laser radiation is provided. It includes the following topics: Maxwell's equations, dielectric permittivity, magnetic permeability, electrical conductivity. Plane electro-magnetic wave. Refraction index, complex refraction index, absorption coefficient. Complex dielectric constant. Reflection coefficient. Fresnel formulas. Passage of radiation through the plate. Film on the substrate. Absorption of an arbitrary layered system. Superlattice. Fresnel formulas for oblique incidence of radiation. Brewster's angle. Total reflection. Evanescent wave. Frustrated total internal reflection. Based on these introductory there are a few problems are discussed: 1) Optimal laser heating. At constant thermal and optical parameters of matter it is possible to diminish energy necessary for heating of material till given temperature selecting the special pulse shape. It is shown how the Ramanujan constant follows from the solution of linear heat equation. 2) Laser Cleaning (basic principles and fundamental problems) and 3) Moments technique to solve heat equation. A semi-analytical approach to a quantitative analysis of thermal ns laser ablation is presented. The nonlinear heat equation is reduced to three ordinary differential equations for the surface temperature, spatial width of the enthalpy distribution, and the ablated depth. Due to its speed and flexibility, the method provides a convenient tool for the fast analysis of experimental data.

Short Biography

Boris Lukiyanchuk received his PhD (Physics and Mathematics) from P. N. Lebedev Physical Institute, Academy of Sciences of USSR in 1979 and his Doctor of Sciences from the General Physics Institute, Academy of Sciences of USSR in 1991. From 1970 to 1980, he was affiliated to the Scientific Research Institute at Moscow, Russia. He was also a Professor, Scientific Advisor and Principal Scientist at Data Storage Institute, A*STAR, Singapore from 1999-2018. Currently he is the Professor, Head of the Nonlinear and Extreme Nanophotonics Laboratory, Lomonosov Moscow State University and Visiting Professor at SPMS, NTU. His research interests include interaction of laser radiation with matter, chemical processing with lasers, nonlinear phenomena, self-organization, laser-ablation, theory of nanocluster formation, photomodification in polymers, laser cleaning, plasmonics, metamaterials, nanoscopy, Nanophotonics and nanoparticles with high refracted index. He is a Honorary Professor at Johannes Kepler University, Austria, a recipient of the IES Prestigious Engineering Achievement Awards (2004), President's Science Award, Singapore (2013). He is a member of the Scientific Counsels of Russian Academy of Sciences, SPIE (2000) and OSA (2010). He has supervised >30 PhD students. He has authored 5 monographs and over 300 original research papers till date.

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TPI The Photonics Institute Singapore

CDPT Centre for Disruptive Photonic Technologies
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