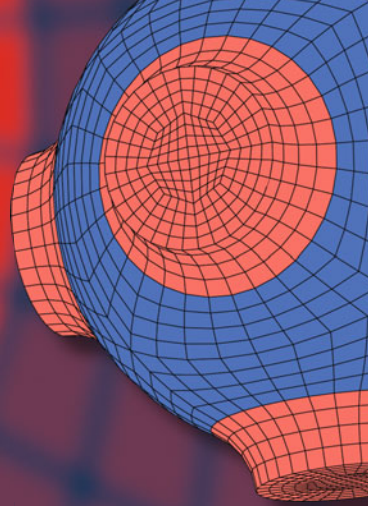
Advanced Structured Materials



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tuPOY: Thermally Unstable Partially Oriented Yarns

Silicon of the Future

Springer

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Preface

The book paves a new dimension in electronics with the invention of a new material *tuPOY*, which changes our perception of developing electronics. Evolving on a relatively underplayed phenomenon of static electricity in scientific exploration and application, *tuPOY* upholds the potential to rival both silicon and metals as electronics of the future. Devices made of *tuPOY* present a new emblem to the technological world, where we could envision our electronic paraphernalia from a completely different perspective. A computer the size of a big wall, which could be neatly folded and kept in our pockets when not in use and laundered on a regular basis, can be imagined possible with this invention. The concept, manufacturing process, physics, and uses of *tuPOY* as the next generation material of electronics is described in this book.

Over 2600 years ago, static electricity first found mention in the books of Thales when he accidently rubbed amber with a piece of fur, and observed that it could attract lightweight objects to itself. Over the years it was conjecturized as 'charge' transferred from one object to another during the process of rubbing so that they could exert a physical force at a distance. During early mornings or mild winters, the 'static cling' we feel when we are garbed in synthetic clothing is associated with transition of the material to a temporary unstable state where it inherits and exhibits the properties of metallic substances at molecular level. We detour from this Thalenonian philosophy to evolve a new hypothesis to this phenomenon by claiming that the synthetic material has propensity to transient fleetingly to a thermally unstable state due to which it exhibits symptomatic properties of metals and semiconductors. The characteristics of a metal and semiconductor are confined permanently in the lattice of the *tuPOY* fiber using a proprietary formulated retardant.

A wealth of spectroscopy techniques are associated to practically and theoretically validate these metallic characteristics of sensing, radiating, and processing properties of *tuPOY*. Theoretical modeling of *tuPOY* is characterized by steady-state equations exploiting interchanges based on the lattice kinetics, which mathematizes an interchange phenomenon in *tuPOY*. The numerical manifestations characterize the inherent response of lattice, thereby spouting a gamut of operations of *tuPOY* devices.

The authors have antecedently given thought to the power requirements for the transistorized material. A symbiotic power generating unit (PGU) with *tuPOY* at its core scavenges power from thermal energy presenting a new dimension in operational power dynamics.

An assemblage of operational *tuPOY* devices (sensors, antennas, transistors, etc.) are obtruded in a milieu of computing scenarios establishing *tuPOY* as a dynamic link connecting kinematical thermodynamics to electrical ambiance.

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