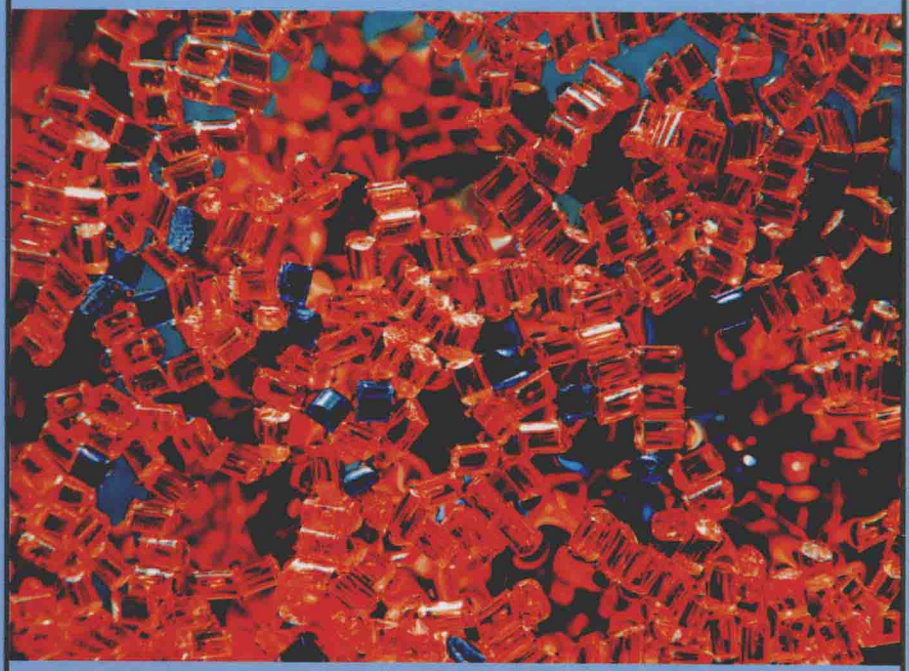
Nanomaterials and Nanotechnology
or Composites

Design, Simulation, and Applications



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Design, Simulation, and Applications

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NANOMATERIALS AND NANOTECHNOLOGY FOR COMPOSITES

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LIST OF ABBREVIATIONS

AC	Activated Carbon
ACF	Activated Carbon Fibers
ACHF	Activated Carbon Hollow Fibers
ACNF	Activated Carbon Nanofiber
AFM	Atomic Force Microscope
AN	Acrylonitrile
BEM	Boundary Element Method
BET	Brunner-Emmett1-Teller
BGK	Bhatnagar-Gross-Krook
BJH	Barrett Joiner Halenda
BSA	Bovine Serum Albumin
CF	Carbon Fiber
CFD	Computational Fluid Dynamics
CH	Calcium Hydroxide
CNT	Carbon Nanotubes
CS	Cellulose
CVD	Chemical Vapor Deposition
DAAD	Deutsche Akademische Austausch Dienst
DDT	Dichlorodiphenyltrichloroethane
DMF	Dimethylformamide
DSB	Double Strand Breaks
EDLCs	Electrochemical Double-Layer Capacitors
EDXS	Energy Dispersive X-Ray Spectrometry
EELS	Electron Energy Loss Spectroscopy
EMEM	Eagle's Minimal Essential Medium
ERKs	Extracellular Signal-Regulated Kinases
FEM	Finite Element Methods
FRC	Fiber-Reinforced Concrete
FTIR	Fourier Transform Infrared
GUC	German University in Cairo
HDPE	High Density Polyethylene
HTS	High Temperature Shearing
HTT	Heat-Treatment Temperature
ISCN	International System for human Cytogenetic Nomenclature
ITZ	Interfacial Transition Zone

LBM	Lattice Boltzmann methods
LDPE	Low Density Polyethylene
LED	Light Emitting Diode
LERT	Large Electrical Relaxation Time Limit
LIBs	Lithium-Ion Batteries
MA	Maleine Anhydride
MD	Molecular Dynamics
MFCs	Microbial Fuel Cells
MMA	Methyl Methacrylate
MWNTs	Multiwall Carbon Nanotubes
NDT	Nottingham Device Test
NEMs	Nano-Electro-Mechanical Systems
NF	Nanofiltration
NILES	National Institute of Laser Enhanced Sciences
NPs	Nanoparticles
NS	Nano-SiO2
NT	Nano-TiO2
ODE's	Ordinary Differential Equations
PAA	Poly (Acrylic Acid)
PAN	Polyacrylonitrile
PBS	Phosphate Buffer Saline
PCN	Polymer Clay Nanocomposites
PDEs	Partial Differential Equations
PEM	Proton Exchange Mat
PGA	Poly(Glycolic Acid)
PHEV	Plug-In Hybrid Electric Vehicles
PLLA	Poly (L-Lactic Acid)
PMMA	Poly(Methyl Methacrylate)
POM	Polarization Optical Microscopy
PP	Polypropylene
PPX	Poly (P-Xylylene)
PTT	Photo Thermal Therapy
PVDC	Polyvinylidene Chloride
PZT	Plumbum Zirconate Titanate
RF	Radio-Frequency
RNP	Responsive Nanoparticle
RSM	Response Surface Methodology
RVE	Representative Volume Element
SAN	Styrene-Co-Acrylonitrile
SBS	Styrene-Butadiene-Styrene
SEI	Solid Electrolyte Interphase
SEM	Scanning Electron Microscope

SERT	Small Electrical Relaxation Time Limit
SMPE	Sulfophenyl Methallyl Ether
SSB	Single Strand Breaks
SSS	Sodium P-Styrene Sulfonate
SWNTs	Single Wall Carbon Nanotubes
TEM	Transmission Electron Microscopy
TFOT	Thin Film Oven Test
TG	Thermogravimetric Method
THF	Tetrahydrofuran
TLBM	Thermal Lattice Boltzmann methods
VA	Vinyl Acetate
VOCs	Volatile Organic Compounds

LIST OF SYMBOLS

A_m	amplitude of nanocomposite vibration
A_{ms}	coefficients of Fourier expansion
b	width of the Specimen
c	velocity of light
d	density of the adsorbate, g/cm^3
$<d>_V$	average arithmetic size
d_f	fractal dimension
F_{max}	maximal force
$\vec{\mathbf{F}}_c$	principal vector of forces
$f_s(\mathbf{p},\mathbf{r})$	Fermi distribution function
$\left\|\vec{\mathbf{F}}_{bi}\right\|$	force magnitude of the nanoparticle interaction
$\vec{\mathbf{F}}_i(t)$	random set of forces at a given temperature
L	span length
$\bar{l}$	mean segment length
M	mass of the dried sample
$\vec{\mathbf{M}}_c$	principal moment
Me (d)	median of distribution defining the size d
Mo (d)	position of maximum (a distribution mode)
m_i	mass of the i^{th} atom
m	mass of adsorbed benzene
$m_{absorbed\ water}$	mass of the water
m_{av}	average mass of medium
m_{cl}	mass of metal containing phase
m_{sample}	mass of the sample
N	number of carbon atoms in lattice
N_{imp}	number of adsorbed hydrogen atoms
N_k	number of atoms forming each nanoparticle
n	number of interatomic interaction types
P	maximum indicated load
p_x	parallel component of the graphene sheet
q	charge of ion
R	flexural strength
S'	modulus of elasticity
S"	loss modulus
s	quasimomentum of the electrons in grapheme

$T(r)$	constant in the linear approximation in magnitude
U	constant of Coulomb repulsion of impurity
U_{trans}	electromagnetic wave transmission velocity
V	hybridization potential
$\vec{v}_{i0}, \vec{v}_i$	initial and current velocities
V_{lj}	matrix element of hybridization

GREEK CHARACTERS

α_{am}	amorphous phase relative fraction
α_i	friction coefficient in atomic structure
$c_{j\sigma}$	Fermi annihilation
$c^+_{j\sigma}$	creation operators of electrons
ε_{ab}	absolute dielectric constant for medium
ε_{prog}	nanocomposite surface energy portion
ε_s^{NC}	surface energy of nanocomposite
$\varepsilon_{l\sigma}$	energy of electron by impurity
Ω_k	area occupied by nanoelement
Φ_{cb}	chemical bonds
Φ_{es}	electrostatics
Φ_{pg}	flat groups
Φ_{hb}	hydrogen bonds
$\Phi(\vec{\rho}_{ij})$	potential depending on mutual positions of all atoms
$\vec{\rho}_{ij}$	radius vector determining the position of the i^{th} atom relative to the j^{th} atom
Φ_{ta}	torsion angles
Φ_{va}	valence angles
Φ_{vv}	Vander Waals contacts
λ	wave length
$n^d_{l\sigma}$	number of electrons on impurities
ρ	medium density
$\vec{\rho}_{cj}$	vector connecting points c and j
g	axial viscous normal stress
χ	relative fraction of elastically deformed polymer
y(j,l)	length distribution
t_Δ	electron hopping integral
U_ζ	velocity vector of the interface
μ_{ab}	absolute magnetic penetrability of medium
φ_m	maximum potential of electromagnetic radiation of nanocomposite
$\vec{x}_{i0}, \vec{x}_i$	original and current coordinates