# Key Engineering Materials

Volume I

**Current State of the Art on Novel Materials** 

**Editors** 

Devrim Balköse, PhD Daniel Horak, PhD Ladislav Šoltés, PhD

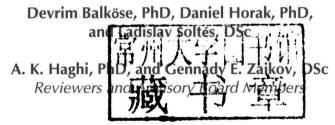




# KEY ENGINEERING MATERIALS

Volume I : Current State of the Art on Novel Materials

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# KEY ENGINEERING MATERIALS

Volume I: Current State of the Art on Novel Materials

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Devrim Balköse, DSc, graduated from the Middle East Technical University (Ankara, Turkey) Chemical Engineering Department in 1969. She received her MS and PhD degrees from Ege University, İzmir, Turkey, in 1974 and 1977 respectively. She became Associate Professor in macromolecular chemistry in 1983 and Professor in process and reactor engineering in 1990. She worked as research assistant, assistant professor, associate professor, and professor between 1970–2000 at Ege University. She was the Head of Chemical Engineering Department at İzmir Institute of Technology, İzmir, Turkey, between 2000–2009. She is now a faculty member in the same department. Her research interests are in polymer reaction engineering, polymer foams and films, adsorbent development, and moisture sorption. Her research projects are on nanosized zinc borate production, ZnO polymer composites, zinc borate lubricants, antistatic additives, and metal soaps.

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Daniel Horak, PhD, graduated from the Institute of Chemical Technology in Prague, Czech Republic, where he received MSc degree in macromolecular chemistry. His PhD degree in chemistry was obtained from the Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic, where he is employed as the Head of the Department of Polymer Particles. He was a post-doctoral fellow at the University of Ottawa in Canada with Professor Frechet in 1983-84, winner of the scholarship from the Japanese Society for Promotion of Science, at the Technological University of Nagaoka with Professor Imai in Japan in 1987–88, visiting scientist at the Cornell University in Ithaca, New York, with Professor Frechet in 1993-94. He also served as a visiting scientist at the University of Montreal in Canada in 2001. His research activity includes magnetic nano- and microspheres, polymer particles by heterogeneous polymerization techniques including emulsion, suspension, and dispersion polymerization; properties of the particles, their chemical modifications and applications in medicine, biochemistry, and biotechnology; immobilization of enzymes and antibodies; hydrogels, sorbents, and ion exchangers; and advanced separation media. He is member of the International Polymer Colloid Group, organizer and chairman of the Polymer Colloid Symposium in Prague 2008 and 2014, editorial board member of Journal of Colloid Science and Biotechnology, and supervisor of PhD students. He has published more than 150 original scientific papers, 7 book chapters (in *Polymeric* Materials Encyclopedia and Strategies in Size Exclusion Chromatography), 10 reviews, many lectures and communications at international symposia, and 7 patents. He has published in Biomaterials, Bioconjugate Chemistry, Journal of Polymer Science,

vi About the Editors

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Ladislav Šoltés, PhD, has expertise in macromolecular and analytical chemistry. He has been employed for over 30 years at academic research institutes in Bratislava, Slovakia. His research related to the polysaccharides, which started over two decades ago, resulted in patenting a novel approach "clathrate complexes formed by hyaluronic acid derivatives and use thereof as pharmaceuticals". His current research interests are focused on the studies of hyaluronan oxidative damage and the regulation of this process. Dr. Šoltés is the only distinguished representative of Slovakia in the International Society for Hyaluronan Sciences, USA. In 2007 he was named Scientist of the Year of the Slovak Republic.

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### LIST OF ABBREVIATIONS

ACA ε-Amino caproic acid

AIDS Acquired immune deficiency syndrome

AI Activity index

ATP Adenosine triphosphate
AP Ammonium perchlorate

APEP Ammonium Perchlorate Experimental Plant

AFM Atomic force microscopy
ASM Atomic-power microscopy

ATR-FTIR Attenuated total reflectance-Fourier transform infrared

spectroscopy

BET Brunauer-Emmet-Teller

BZONO 4-Benzoate-2,2,6,6-tetramethyl-1-piperidinyloxy

BSR Butadiene-styrene rubber
BTTN Butanetholtrinitrate

CNT Carbon nanotubes
CMC Cell membrane complex

CAB Cellulose acetate butyrate
CVD Chemical vapor deposition

CoSt2 Cobalt stearate

CVID Common variable immune deficiency

CFD Computational fluid dynamics

CuSt2 Copper stearate

RDX Cyclotrimethylene-trinitramine

DD Deacetylation degree

DNA Deoxyribonucleic acid molecule

DBTL Dibutyltindilaurate
DEGDN Diethyleneglycol dinitrate

DSC Differential scanning calorimetry
DTA Differential thermal analysis

DOP Dioctylphthalate

DFM Dynamic force microscope

DMTA Dynamic mechanical thermal analysis
EPR Electron paramagnetic resonance
EBID Electron-beam-induced deposition

EDS Energy dispersive spectroscopy

EDX Energy dispersive X-ray EAA Ethylene–acrylic acid

EDA Ethylenediamine

EOE Ethylene-octene elastomers

**EPDM** Ethylene-propylene-diene elastomer

**EVA** Ethylene-vinyl acetate

**EXAFS** Extended X-ray absorption fine structure

FD Formaldehyde

5-Fluoro-2'deoxyuridine **FdUR** 

Fourier transform infrared spectroscopy FTIR

GDLs Gas diffusion layers

GlcN Glucose amine

High density polyethylene **HDPE** Human immunodeficiency virus HIV

HC1 Hydrochloric acid

**HBP** Hyperbranchedpolymers

Infrared IR

IIR Isobutylene-isoprene rubber

IPP Isotactic polypropylene

Kinetic theory granular flow model KTGF Langmuir-Blodgett multilayers LB

Lattice Boltzmann model LB

LOI Loss of ignition

LDPE Low density polyethylene LMC Low-molecular compound Magnesium stearate

MgSt2

MALDI-TOF Matrix-assisted laser desorption/ionization time of flight

MW Matt waste

Medium density fiberboard MDF Melamine urea-formaldehyde **MUF** MEF Melamine-formaldehyde

Melamine-urea-phenol-formaldehyde **MUPF** 

MFI Melt flow index

Metal hydroxide salts MHS

Methylene blue MB MW Molecular weight NK Natural killer

Nitrate ester plasticized polyether NEPE

NG Nitroglycerin

N-Methyl-p-nitroaniline MNA

**NBRs** Acrylonitrile-butadiene rubbers Nuclear magnetic resonance **NMR** 

Objective-based simulated annealing OSA

Ordinary Portland cement OPC

Owens-Wendt-Rabel-Kaelble method **OWRK** 

Para-benzoquinone pBQ PF Phenol-formaldehyde

**PPMS** Physical property measurement system