Konstantin (Kostya) Kornev

Associate Professor
Micro and Nano Fludic Systems

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EDUCATION

PhD, Physics and Mathematics, Kazan State University (KSU), Russia 1988

M.S, Mechanics & Mathematics, Kazan State University (KSU), Russia 1983

Dr. Konstantin Kornev graduated from the Department of Mechanics and Mathematics at Kazan State University (KSU) in Russia in 1988. From 1988 until 1990, he worked at the Institute of Mechanics and Mathematics at KSU. In 1990 he has been invited to join the Institute for Problems in Mechanics, RAS, the leading institution of the Russian Academy of Sciences in the field of mechanics. While at RAS, he worked as an Associate Professor of Physics at the University of Aircraft Technology in Moscow. In 2000, he joined the Textile Research Institute in Princeton, NJ. Since August of 2006 he is the Associate Professor in the School of Materials Science and Engineering in Clemson University, SC.

EXPERIENCE

Dr. Kornev is an expert in Hele-Shaw flows, flows through porous media, phase transitions in forced flows, flow and rheology of complex fluids, and micro and nanofluidics. He has written a monograph on the subject of foams in porous media and has authored more than 60 technical papers

Dr. Kornev has a Postdoctoral position open in his applied physics/nanofluidics group.

Description of Research Opportunities
Micro and Nanofluidics Lab, School of Materials Science & Engineering
Clemson University, SC

Field-controlled manipulation of minute amount of liquids in fiber-based nanofluidics

One research associate/post-doctoral position is available immediately to work on a 4-year program on field-controlled manipulation of microdroplets. The program is focused on development of fundamental principles of liquid/solid interactions at micro and nanoscales in the presence of electro-magnetic fields. The candidates are expected to be familiar with flow imaging, optical diagnostics, and basic techniques of physico-chemical fluid mechanics. BS or MS students with background in physics, mechanics, chemical engineering, materials science & engineering, or applied mathematics are encouraged to apply for PhD student positions. We are looking for dynamic and active researchers interested in working with a strong team of graduate students in the state-of-the-art Micro and Nanofluidics Lab. Currently, the group consists of 7 PhD students and two post doctoral fellows with background in physics, mechanical engineering, and materials science. The environment of the School of Materials Science & Engineering at Clemson University is friendly and welcoming for researchers looking for broadening their knowledge, expertise, and growth potential.

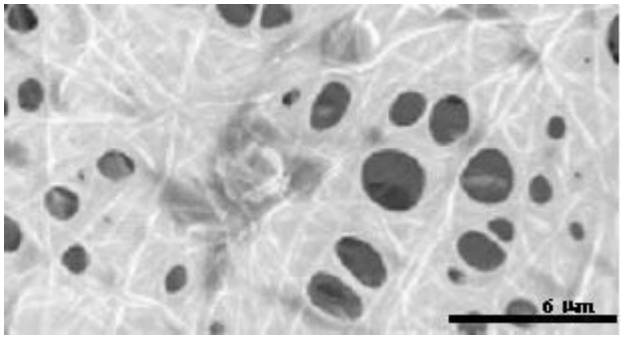
To apply:

Any questions and applications should be directed to Dr. Konstantin Kornev kkornev@clemson.edu and should include your CV and goal statement.

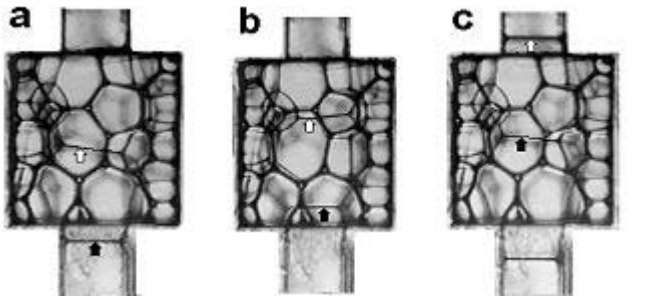
RESEARCH

His current research activities focus on engineering new micro- and nano-fluidic systems with conduits made of micro and nanofibers. Development of fiber-based micro-and nano-fluidics cannot be done without a strong basic research addressing the problems of fiber manufacturing, the problems of controlled manipulation and transport of micro-quantities of fluids through fibrous structures. Driven by the idea to speed up the liquid transport in fluidic devices, the research explores a new method of droplet manipulation by using conduits formed by fiber rails. In these conduits, the droplet dispersion and coalescence is controlled by changing the inter-fiber spacing. Compared to conventional microchannel designs, the fiber-based conduits significantly reduce the viscous drag and can be constructed from available microfibers of different cross-sectional shapes. Currently, the approach is extended on “shaped microfibers”, electrospun nanofibers, and available nanotubes. The proposed concepts are also studied in applications to fiber-based micro-and nanofluidics for drug nanoencapsulation and delivery, for biosensors and for nanorheological devices to probe liquids from secretory glands and from microorganisms.

Nanowebs as templates to produce new materials:



Nanofoam



Mechanism of lamella motion through micro- and nano-channels

Recent Publications

M. Kulakov, I. Luzinov, and K. G. Kornev, Capillary and Surface Effects in the Formation of Nanosharp Tungsten Tips by Electropolishing, Langmuir, Article ASAP, 2009.

Kokuoz B., Kornev K.G., and Luzinov I., Gluing Nanoparticles with a Polymer Bonding Layer: The Strength of an Adhesive Bond. ACS Applied & Materials Interfaces, Article ASAP (2009)

Rossi M.P., Gogotsi Y., and Kornev K.G. Deformation of Carbon Nanotubes by Exposure to Water Vapor, Langmuir, 25, 2804-2810(2009).

Reukov V., Vertegel A., Burtovyy O., Kornev K., Luzinov I., Miller P., Fabrication of nanocoated fibers for self-diagnosis of bacterial vaginosis, Materials Science and Engineering: C, Article ASAP, (2008)

Monaenkova D., Andrukh T., Kornev K.G., Absorption-Induced Deformations of

Nanofiber Yarns and Nanofibrous Webs, Mater. Res. Soc. Symp. Proc. Vol. 1129 © 2009 Materials Research Society 1129-V05-05

Kornev K.G., Halverson D., Korneva G., Ye H., Gogotsi Y., and Friedman G., Magnetostatic interactions between carbon nanotubes filled with magnetic nanoparticles, Appl.Phys.Lett, 92, 233117 (2008)

Alimov M.M.& Kornev K.G., Impregnation of liquids into a laminated porous material with a high permeability contrast, Physics of Fluids, 19, 102108 (2007)

Kornev K.G., Burstyn H., Kamath Y., Electro-impregnation of yarns and fabrics with nonwetting liquids, J. Applied Physics, 101(10), May (2007).

Kornev K.G., Callegari G., Kuppler J, S.Ruesch, Neimark A.V., Ribbon-to-fiber transformations in the process of spinning of carbon nanotube fibers, Physical Review Letters, 97, 188303 (2006)

Kornev G., Ye H., Gogotsi Y., Halverson D., Friedman G., Bradley J.-C., and Kornev K.G., Carbon nanotubes loaded with magnetic particles, Nano Letters, 5 (5), 879-884 (2005).

Nikitin L.V., Mironova L.S., Kornev K.G. and Stepanov G.V., Magnetic, elastic, structural and magneto-deformational properties of magnetoelastics. Polymer Sci.,46, (3), 301-309 (2004).

· Keis K., Kornev K.G., Kamath Y.K., and Neimark A.V., Towards Fiber-Based Micro- and Nanofluidics, in “Nanoengineered Nanofibrous Materials”, NATO Science Series II: Mathematics, Physics and Chemistry, 169, Guceri, S., Gogotsi, Y.G., Kuznetsov V. (Eds.), Kluwer Publishing, 175-182 (2004).

Kornev K.G., Callegari G., Neimark A.V. Capillary microfluidics for viscoelastic fluids”, XXI International Congress on Theoretical and Applied Mechanics, Warsaw, Poland, Gutkowski W., Kowalewski T.A., (Eds.) Kluwer Publishing, 65-67 (2004).

Kornev K.G. and Srolovitz D.J. Surface Stress Driven Instabilities of a Free Film, Appl.Phys.Lett, 85, 13, 2487-2489 (2004); 86, 249901 (2005);

Egorov, A.G., Kornev, K.G., and Neimark, A.V. Meniscus motion in a prewetted capillary. Physics of Fluids, 15 (10), 3134-3143 (2003).

·Bazilevsky, A.V., Kornev, K.G., Rozhkov, A.N., Neimark, A.V., Spontaneous absorption of viscous and viscoelastic fluids by capillaries and porous substrates. J.Colloid Interface Sciences, 262, 16-24 (2003).

·Kornev, K.G., Neimark, A.V., Modeling of spontaneous penetration of

viscoelastic fluids and biofluids into capillaries. J.Colloid Interface Sciences, 262, 253-262(2003).

Neimark A.V., Ruetsch S., Kornev K.G., Ravikovitch P.I., Poulin P., Badaire S., Maugey M., Hierarchical pore structure and wetting properties of single wall carbon nanotube fibers, Nano Letters, 3, 419-423 (2003).

· Marelius F and Kornev K, Phenomenological Characterization of Vortex Induced Scour, Journal of Hydraulic Engineering-ASCE, 129 (12), 976-984 (2003).