

Nanocomposite Polymer Networks: From Controlled Synthesis to Applications in Medicine

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We apply chemical engineering fundamentals are applied to the rational design, synthesis, and application of novel macromolecular materials. We are particularly interested in designing and fabricating intelligent polymer networks based on nanocomposite hydrogels. Although the majority of hydrogel applications have been in biology and medicine, there is great promise for these materials to impact other areas as advanced materials, especially as nanocomposites.

For example, nanocomposite hydrogels are a new class of intelligent materials, which have recently attracted interest as biomaterials. The incorporation of nanoparticles into a hydrogel matrix can provide unique properties including remote actuation and also improve properties such as mechanical strength. The properties of the nanocomposites can be easily tailored by manipulating the properties of hydrogel and the nanoparticulate material. Here, our broad activities in the development and application of hydrogel nanocomposites will be presented. In particular, hydrogel nanocomposites with magnetic particles, which have been demonstrated as potential candidates for pulsatile drug delivery and soft actuator applications, will be highlighted.

Short bio:

J. Zach Hilt is an Associate Professor of Chemical Engineering in the Department of Chemical and Materials Engineering at the University of Kentucky. Prof. Hilt received his bachelor degrees in Chemistry and Physics from Miami University (Ohio). He completed his Masters degree in Chemical Engineering from Purdue University and his Doctor of Philosophy in Chemical Engineering from the University of Texas at Austin. Prof. Hilt's research laboratory focuses on the design of novel hydrogel biomaterials, the development of novel methods to synthesize and characterize the hydrogels at the micro- or nanoscale, and the application of these materials as biomedical devices or functional components of biomedical devices. Prof. Hilt has authored numerous referred publications, including a recent review "Hydrogels in Biology and Medicine: From Molecular Principles to Bionanotechnology" published in *Advanced Materials*. He is co-editor of "Nanotechnology in Therapeutics: Current Technology and Applications" which is published by Horizon Scientific Press and is one of the first books dedicated to the topic of nanotechnology in drug delivery. Prof. Hilt was an invited participant in the 2008 German-American Frontiers of Engineering Symposium (GAFOE), which was co-organized by the National Academy of Engineering (NAE) and the Alexander von Humboldt Foundation. He is a member of the American Institute for Chemical Engineers, Materials Research Society, Society for Biomaterials, American Chemical Society, and the Biomedical Engineering Society. He has taken an active role in these professional societies, including co-organizing the Bionanotechnology sessions at the Annual AIChE Meeting for the past few years.