Commercialization of Fluoropolymers for Integrated Optics and Other High Performance Applications: A Perspective on NSF SBIR Phase II Research from a Faculty Consultant / Entrepreneur

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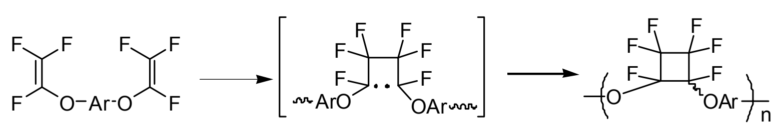
Organic polymers are increasingly attractive alternatives to inorganic materials in telecommunication devices. Polymers offer flexibility, low cost fabrication and connection, high transparency in the visible and near-infrared spectra, and versatility in structure, properties, and grades for task specific integration such as local-area-network applications. Halogenated polymers in particular show negligible transmission losses in the range desired and fluoropolymers represent the lowest loss examples of organic polymers to date. However, commercial perfluoropolymers in general are limited by poor processability, non-trivial refractive index matching, and they typically do not exhibit the thermal and thermomechanical stability required for some commercial processes and extreme environment in-use applications. Our multi-disciplined strategy at Clemson has focused on the thermal cyclopolymerization of trifunctional and bifunctional aryl trifluorovinyl ether monomers to perfluorocyclobutane (PFCB) copolymers. PFCB polymers and copolymers enjoy a unique combination of properties well suited for optical applications such as high temperature stability, precisely controlled refractive index, low moisture absorption, excellent melt and solution processability, a variable thermooptic coefficient, and low transmission loss at 1550 nm.



General cyclopolymerization to perfluorocyclobutyl (PFCB) polymers.

Much of this technology has been patented by Clemson University, the commercialization of which is now the primary focus of local start-up, Tetramer Technologies, L.L.C. The company was established in 2001 by Clemson faculty due to customer driven demands for optical materials matching those properties offered by PFCB technology. Today, Tetramer enjoys Phase II SBIR support from NSF for the title technology and two additional Phase I awards for unrelated research. The SBIR success for a relatively young faculty start-up at Clemson University has inspired growth in both acceptance and policy concerning the concept of including entrepreneurial driven economic development in the mission of research faculty. As in all growth, however, growing pains are inevitable. This paper will overview the path of technical success for PFCB technology leading to the Phase II program and current progress to date while attempting to offer a realistic perspective on the management of traditionally conflicting cultures generally encountered by faculty entrepreneurs from the campus to the board room.

References:

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