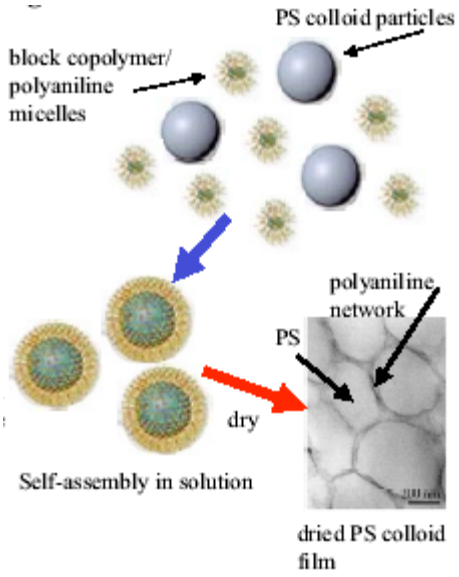
Inexpensive Polymer Coatings that Conduct Electricity
"Watching Conducting Paints Dry"
Fredrickson, Kramer and Heeger IRG3

Latex paints consist of polymer colloids in solution that assemble into a solid film as the solvent, usually water, evaporates. We have devised an inexpensive way to use this assembly mechanism to produce electrically conducting paint films with less than 2% of a conducting polymer additive, polyaniline (PANI). Micelles of a block copolymer with PANI are prepared in solution to which cheap polystyrene (PS) latex particles are added. The PS block of the block copolymer adsorbs to the surface of the PS colloids with the PANI in the outermost layer and, as the film dries, the PANI is confined to the thin layers between particles where it forms a electrically conducting network. Since very little PANI overall is needed for the thin layer network between PS particles to become conductive, this method promises cheap paints for anti-static and other applications.

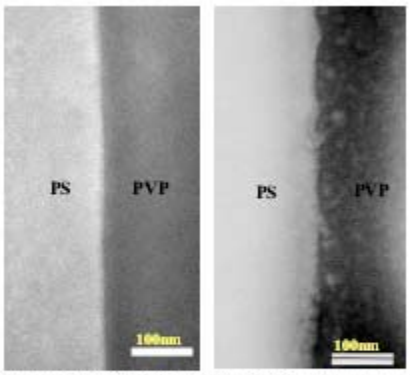


Science **209** 1872 (2003)

The Quantitative Study of Interfacial Instability Induced by the Reaction of End-Functional Polymers

Edward J. Kramer, Glenn H. Fredrickson, UCSB, DMR00-80034

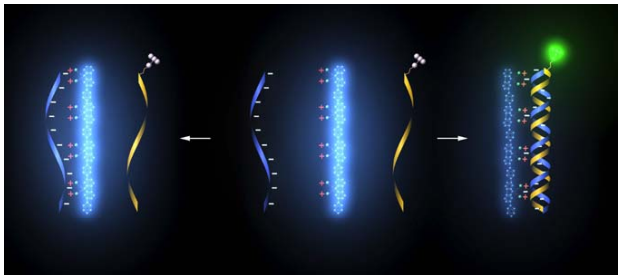
Reactive blending facilitates the development of new polymer materials with desired physical properties due to the unique combination of polymer components. In our system, diblock copolymers formed by the reaction of endfunctional polymers are located at the interface between immiscible polymers. They suppress the coalescence of the dispersed phase and induce complex nonequilibrium morphologies such as bicontinuous microemulsions through the reduction of interfacial tension. The study of this system provides an opportunity to develop advanced research tools such as atomic-scale microscopies and the fieldtheoretic simulation technique, and apply these tools to the study of nonequilibrium phenomena in polymeric fluids of commercial significance.

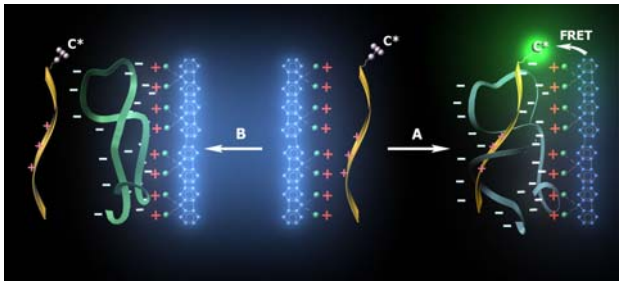


Cross-sectional TEM micrograph of an interface between polystyrene (PS) and poly(2-vinylpyridine) (PVP). While a flat interface was observed in the left image where no end-functional polymer was added into a homopolymer blend, a complex morphology was observed in the right image where end-functional polymers were added.

Water Soluble Conjugated Polymers for DNA Sensing
Bazan and Heeger IRG3 DMR-0080034

It is possible to coordinate the electrostatic interactions characteristic of polyelectrolytes with the fluorescence amplification of conjugated polymers to create highly sensitive DNA sensors. DNA hybridization to a PNA labeled with a reporter chromophore changes the charge of the macromolecule bearing the chromophore from neutral to negatively charged. Under these circumstances, Coulombic forces bring the DNA/PNA hybrid into close proximity to a positively charged conjugated polymer and allow for efficient fluorescence energy transfer from the polymer to the chromophore. A change of emission color from blue to green indicates the presence of DNA with a sequence that recognizes the preprogrammed sequence on PNA. A similar recognition scheme can be used to identify protein/RNA interactions.





Adv. Mat. 2003, 15, 1425
Adv. Funct. Mat. 2003, 13, 463

2004 IUMRS Somiya Award awarded to C.N.R. Rao and A.K. Cheetham

The Year 2004 IUMRS Somiya Award was awarded to Prof. C.N.R. Rao, FRS, Linus Pauling Professor and Honorary President, at the Jawaharlal Nehru Centre for Advanced Scientific Research, in Bangalore, India, and Prof. A.K. Cheetham, FRS, director of the Materials Research Laboratory at the University of California, Santa Barbara, USA, for their collaboration on the synthesis and characterization of novel materials.

C.N.R. Rao and A. K. Cheetham with Nobel Laureate Walter Kohn (far left) and Dean of Engineering at UCSB, Matthew Tirrell (far right)

C.N.R. Rao and A.K. Cheetham have collaborated on research for over three decades, in emerging areas of materials chemistry, including magnetic-, nano-, and open-framework materials. In addition to their research collaboration, Rao and Cheetham have jointly organized workshops, including workshops for the Third World Academy of Sciences and the Institute for Theoretical Physics; they co-edited a book (with Achim Muller) on *Chemistry of Materials* (Wiley-VCH, Weinheim, 2004); and they have made a documentary film on the life of C.N.R. Rao for Vega Trust (www.vega.org.uk). They hold official positions in each other's centers, where Rao is a Distinguished Visiting Professor in the Materials Research Laboratory and Cheetham is a Distinguished Fellow at the Jawaharlal Nehru Centre for Advanced Scientific Research.

Materials Research Outreach Program (MROP) at UCSB

The MROP at UCSB is an annual event that is designed to stimulate collaborative research between faculty groups at UCSB and industry scientists and engineers under the auspices of our Materials Research Laboratory (NSF-MRSEC). Several UC-industry joint research efforts have been initiated as a result of this Program.

The scientific program features talks by UCSB faculty, students and industry representatives, as well as poster sessions where the scope of materials research at UCSB can be appreciated through one-on-one contact with graduate students, post-docs and faculty.