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		Polymer blends Semicrystalline Polymers block copolymers	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Three years of ONR sponsored research in the laboratory has resulted in the discovery of synthetic pathways to produce novel semicrystalline diblock copolymers suitable for emulsifying semicrystalline polymer blends. A model blend system was studied and morphology/mechanical properties relationships were established. Some work on the gas transport behavior of oriented heterogeneous diblocks was conducted. (TR)			
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Summary of the Major Research Results: 5-1-87 to 9-30-90

Our ONR sponsored research has addressed questions of structure/property interrelations in heterogeneous polymer systems. In one branch of the research program we explored the ternary phase diagram of diblock copolymer AB/homopolymer A/homopolymer B for the case of A = isotactic 1,2 polybutadiene; B = trans 1,4 polybutadiene and AB = amorphous 1,2/1,4 diblock copolymers. We have established the trends in mechanical behavior around the ternary diagram (Technical reports 6 and 4). In another aspect of the work we have successfully synthesized novel diblock copolymers containing semicrystalline moieties including nylon 6/polydimethylsiloxane (Technical report No. 8), isotactic polystyrene/polybutadiene (Technical report No. 5) and atactic polystyrene/polyethylene (Technical report No. 7). Important "path dependent" (i.e. process history dependent) morphological features were observed (Technical report No. 7). Detailed molecular and morphological information for amorphous diblocks was obtained via neutron scattering experiments conducted on specially synthesized copolymers containing perdeuterated moieties (Technical reports 3, 2, and 1). Finally, toward the end of the reporting period, we began to build up our capabilities in the area of gas transport in heterogeneous polymer systems, in anticipation of the work proposed in the latest renewal proposal. These exciting results are reviewed in Technical reports 9, 10 and 11.



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ONR Technical Reports

<u>Report numbers</u>	<u>Title</u>	<u>Authors</u>
1.	Distribution of Matrix Homopolymer in Block Copolymers of Spherical Morphology	C.V. Berney P. Cheng R.E. Cohen
2.	Distribution of Chain Ends Inside the Polybutadiene Microspheres of SB Diblock Copolymers	P. Cheng C.V. Berney R.E. Cohen
3.	Spatial Organization of Homopolymer Chains Inside Spherical Polybutadiene Domains of SB Diblock Copolymers	P. Cheng C.V. Berney R.E. Cohen
4.	Blends of Crystallizable Polybutadienes	M. Marx R.E. Cohen
5.	Synthesis and Characterization of Isotactic Polystyrene-Polybutadiene Block Copolymers	L. Gazzaniga R.E. Cohen
6.	Characterization of Crystallizable Polybutadiene Blends	M. Marx Nir R.E. Cohen
7.	Path Dependent Morphologies of a Diblock Copolymer of Polystyrene/Hydrogenated Polybutadiene	R.E. Cohen P. Cheng K. Douzinas P. Kofinas C.V. Berney
8.	Synthesis of Polydimethylsiloxane-Nylon 6 Diblock Copolymers	C.A. Veith R.E. Cohen
9.	CO ₂ Diffusion and Solubility in a Polystyrene/Polybutadiene Diblock Copolymer with Highly Oriented Lamellar Morphology	D.H. Rein J.J. Csernica R.F. Baddour R.E. Cohen
10.	Modification of Polystyrene/Polybutadiene Block Copolymer Films by Chemical Reaction with Bromine and Effect on Gas Permeability	J. Csernica D.H. Rein R.F. Baddour R.E. Cohen
11.	Gas Solubility in Glassy Polymers - A Correlation with Excess Enthalpy	D.H. Rein R.F. Baddour R.E. Cohen

All of these reports have been or will be revised slightly and submitted for publication in journals. Several have already appeared in print as indicated below:

<u>Report number</u>	<u>Literature citation</u>
1.	<u>Macromolecules</u> , <u>21</u> , 2235 (1988)
2.	<u>Macromolecules</u> , <u>21</u> , 3442 (1988)
3.	<u>Makromol. Chemie</u> , <u>190</u> , 589 (1989)
5.	<u>Macromolecules</u> , <u>22</u> , 4125 (1989)
7.	<u>Macromolecules</u> , <u>23</u> , 324 (1990)
9.	<u>Macromolecules</u> , <u>23</u> , 4456 (1990)

<u>Personnel</u>	<u>Current status</u>
P. Cheng	Obtained doctoral degree - DuPont
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C. Veith	Obtained doctoral degree - U.S. Patent Office
L. Cazzaniga	Will defend doctoral thesis Dec. 1989 - U. Carbide
D.H. Rein	Doctoral thesis in progress at MIT
M. Marx Nir	Doctoral thesis in progress at MIT
K. Douzinas	Doctoral thesis in progress at MIT
P. Kofinas	Doctoral thesis in progress at MIT