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A RESEARCH PROJECT ON THE EMULSIFYING AND HOMOGENIZING
PROPERTIES OF BLOC. (U) MASSACHUSETTS INST OF TECH
CAMBRIDGE DEPT OF CHEMICAL ENGINEE. . R E COHEN

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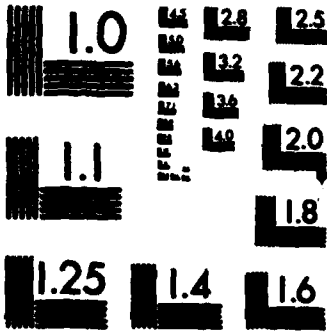
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MICROCOPY RESOLUTION TEST CHART
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<p>Ten years of ONR sponsored research in this laboratory has led to a clear and unified view of the emulsifying or homogenizing role of diblock copolymers in blends of amorphous rubbery polymers. Recent work emphasized that a similar, but more complex set of phenomena may be useful in the manipulation of semicrystalline polymer blend morphologies and properties. The research focused on model polymers comprised of nonpolar hydrocarbon repeat units. The work built on strong capabilities for in-house synthesis of the required homopolymers and diblock copolymers and for molecular, morphological, and mechanical characterization of the selected polymers. <i>Block Copolymers, Emulsions</i></p>			
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SUMMARY OF THE MAJOR RESEARCH FINDINGS

Our ONR-supported research program has addressed the questions: How does the morphology of multicomponent polymers influence physical properties and how can morphology be purposefully manipulated to alter properties. We have focused attention on model systems of well-characterized, in-house-synthesized homopolymers and diblock copolymers comprised of non-polar hydrocarbon repeat units. Early work on amorphous, rubbery blends laid the foundation of experimental evidence (Technical Reports 1, 2, 3, 6, 7, 9) for the presentation of a unified view (Technical Report 8) of the UCST-type phase diagrams for these blends and of the full range of possibilities for the role of diblock copolymers as morphology regulating agents in these blends (Technical Reports 8, 10, 11).

About three years ago emphasis shifted to the challenging problem of semicrystalline polymer blends. Again the simple hydrocarbon repeat unit ~~was retained~~ so as to build on the previous knowledge developed for the analogous amorphous systems. As before, in-house synthesis of the semicrystalline homopolymers and block copolymers supported the experimental program. As hoped, we were able to demonstrate the efficacy of a semicrystalline diblock copolymer as a morphology control agent in semicrystalline polymer blends (Technical Reports 12, 15, 16).

In addition to ONR technical reports, major publications, i. e. those which have appeared in refereed journals, describe the research results in full detail and are listed below. Two patents also resulted from the research and these are listed separately. Students and other research personnel supported on the research program and the titles of their theses, where applicable, are also listed below.

ONR TECHNICAL REPORTS

<u>Report number</u>	<u>Title</u>	<u>Authors</u>
1.	Viscoelastic Properties of Homopolymers and Diblock	A.R. Ramos R.E. Cohen

**Copolymers of Polybutadiene
Polyisoprene**

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| 2. | Homogeneous and Heterogeneous Blends of Polybutadiene, Polyisoprene and Corresponding Diblock Copolymers | A.R. Ramos
R.E. Cohen |
| 3. | Modelling of the Viscoelastic Behavior of Homogeneous and Heterogeneous Blends of Polyisoprene and Polybutadiene | A.R. Ramos
R.E. Cohen |
| 4. | Synthesis Characterization Morphology of a Cis 1,4 Polyisoprene/Poly n-butylmethacrylate Diblock Copolymer | F.S. Bates
R.E. Cohen |
| 5. | Preparation of Homogeneous 'Living' Polyvinyl Gels with Application to Solvent Purification | F.S. Bates
R.E. Cohen |
| 6. | Properties of Some Diblock Copolymers Based on 1,3 Butadiene Monomer | J.M. Torradas
D.E. Wilfong
R.E. Cohen |
| 7. | Morphology and Mechanical Behavior of Blends and Diblock Copolymers of 1,2 and 1,4 Polybutadiene | D.E. WDilfong
R.E. Cohen |
| 8. | Homogeneous and Heterogeneous Rubbery/Rubbery Diblock Copolymers and Polymer Blends - A Unified View | R.E. Cohen |



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9. Estimation of the Homogenization Temperature of A 1,2 Polybutadiene Diblock Copolymer Using Rheological Testing Methods M.-Y. Lin
R.E. Cohen
10. Homogenizing Properties of Diblock Polymers in Blends of Corresponding Homopolymers M.A. Hartney
R.E. Cohen
11. Homopolymer - Induced Micro-phase Separation of a Homogeneous Diblock Copolymer J.M. Torradas
R.E. Cohen
12. Compatibilizing Effect of a Diblock Copolymer of Isotactic Polystyrene and Isotactic Polypropylene in Blends of the Corresponding Homopolymers L. DelGiudice
G. Attalla
F. Bertinotti
R.E. Cohen
13. Diblock Copolymers of Polystyrene/1,2 Polybutadiene and Polystyrene/Polybutene-1: Molecular Structure, Morphology and Mechanical Properties J.M. Torradas
R.E. Cohen
14. Synthesis and Characterization of a 1,4 Polybutadiene/Isotactic Polypropylene Block Copolymer M.A. Drzewinski
R.E. Cohen
15. Crystallization and Nucleation in a Polybutadiene-Isotactic Polypropylene Block Copolymer and the Corresponding Blend M.A. Drzewinski
R.E. Cohen
16. Block Copolymers of Isotactic Polypropylene M.A. Drzewinski
R.E. Cohen

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| 17. | A Reexamination of Single Chain Scattering in Heterogeneous Block Copolymers | C.V. Berney
P. Kofinas
R.E. Cohen |
| 18. | SANS Studies of the Configurations of Single Chains in Heterogeneous Block Copolymers | C.V. Berney
P. Cheng
P. Kofinas
R.E. Cohen |

MAJOR PUBLICATIONS IN REFEREED JOURNALS

<u>Number</u>	<u>Title/Journal</u>	<u>Authors</u>
1.	SANS Studies of the Configuratin Single Chains in Heterogeneous Block Copolymers, <u>J. Materials Research</u> , in press (1987)	C.V. Berney P. Cheng P. Dofinas R.E. Cohen
2.	A Reexamination of the Configurations of Single-Chain Scattering in Heterogeneous Block Copolymers, <u>Polymer Communications</u> , <u>27</u> , 330 (1986)	C.V. Berney P. Kofinas R.E. Cohen
3.	Block Copolymers of Isotactic Polypropylene and 1,4 Polybutadiene, <u>J. Polymer Sci. Chem.</u> , <u>24</u> , 2457 (1986)	M.A. Drzewinski R.E. Cohen
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| 17. | The Influence of Diblock Copolymers
on the Structure and Properties
of Polybutadiene-polyisoprene
Blends, <u>Polym. Eng. Sci., 17, 639
(1977)</u> | A.R. Ramos
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PATENTS

Number

Title/Reference

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1. Polybutadiene-Polyisoprene-Diblock Co-polymer Blends, United States Letters Patent Application, Filed August 21, 1978. Assigned to Massachusetts Institute of Technology, No. S.N. 936, 142 issued as U.S. Patent 4, 167, 544 Sept. 11, 1979. A.R. Ramos
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2. Macroscopic Divinylbenzene Homogeneous Gels and Process, United States Letters Patent Application, Filed September 19, 1983. Assigned to Massachusetts Institute of Technology, No. SN 533, 169 issued as U.S. Patent 4, 485,207, November 27, 1984. F.S. Bates
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