



POLYMER IRC

Introduces

Polymer Science & Technology

9 Day Modular Course

29th October 2007 – 8th November 2007

Venue

Novotel Sheffield



Polymer Science & Technology

9 Day Modular Course

Polymer IRC

The Polymer IRC brings together skills and resources in macromolecular science and technology from leading academic institutions:

Universities of Bradford, Durham, Leeds and Sheffield.

It facilitates the building of effective multidisciplinary teams on the basis of scientific technological requirements. Core science and industrial collaboration are of equal importance.

Access to our expertise can be through:

- Training from one-day courses to degrees
- Consultancy and testing services
- Short-term development and feasibility projects
- Collaborative and sponsored research
- Licensing of technology and joint ventures for commercialisation

WEEK ONE (29th October 2007 – 2nd November 2007)

Day 1: Basic Polymer Science part I

Day 2: Basic Polymer Science part II

Day 3: Polymer Chemistry

Day 4: Polymer Engineering (Polymer Processing)

Day 5: Polymer Physics

WEEK TWO (5th November 2007 – 8th November 2007)

Day 6: Multi-phase Polymer Materials and Composites

Day 7: Polymer Dynamics and Macromolecular Rheology

Day 8: Polymeric Biomaterials

Day 9: Polymer Nanotechnology



Intended Audience

This course is designed for personnel with a need to know more about polymer science and technology and should appeal to those with some background in the sciences and who wish to broaden their horizons with a general overview of these topics. It has been approved by IOM³ for professional development.

This course is specifically for you if: you interact with polymer scientists (either as customers, suppliers or research and development teams); or you are commercial/ engineering/production based and need to understand more about how your products and/or processes work.

Course Notes

Each participant will receive at the beginning of the course, a bound set of course notes and a CD of the same information.

Please note that we reserve the right to make changes to the course content and lecturers should it be necessary.

Basic Polymer Science (Part I) – Synthesis, Properties and Processing – Module Programme

Presenters: Professor J.R. Ebdon (JRE) and Dr B.J. Hunt (BJH)

09.30 - 10.00	Registration Welcome and Tea/Coffee	
10.00 - 10.50	Introduction	(JRE)
10.50 - 11.25	Structures and Molecular Weights	(BJH)
11.25 - 11.40	Tea/Coffee	
11.40 - 12.15	How Polymers are Made: Chain Reaction Polymerizations	(JRE)
12.15 - 12.50	Properties of Polymers: Thermal and Optical	(BJH)
12.50 - 13.30	Lunch	
13.30 - 14.05	How Polymers are Made: Step Reaction Polymerisations	(JRE)
14.05 - 14.40	Processing of Polymers	(BJH)
14.40 - 15.15	Properties of Polymers: Mechanical and Electrical	(JRE)
15.15 - 15.30	Tea/Coffee	
15.30 - 16.05	Properties of Polymers: Chemical and Solution	(BJH)
16.05 - 16.40	Specific Polymers and Applications	(JRE)
16.40 - 17.00	Question and Answer Session	
17.00	Close	

Module Objectives

This course is designed as an introduction to the subject of polymer science and gives an overview of how this applies to a wide range of materials, processes, products and applications. If your company works with plastics, rubbers, adhesives, composites, coatings, fibres or packaging and requires some basic knowledge about polymeric materials, or have a requirement to analyse or characterise their behaviour, then this course will benefit you.

Part I of this course will give you an introduction to the science underlying the synthesis and processing of polymers, some basic information about their structures and properties and present some examples of their applications.

In Part II of the course you will learn about the range of modern instrumental techniques which can be used to analyse the structure and behaviour of polymeric materials. It will give a more detailed and in-depth view of some of the topics briefly presented in part I.

Delegates can attend either of these modules independently but they are designed to complement one another and to give a comprehensive introduction to Polymer Science.

Basic Polymer Science (Part II) – Characterisation and Analysis – Module Programme

Presenters: Professor J.R. Ebdon (JRE) and Dr B.J. Hunt (BJH)

09.30 - 10.00	Welcome and Tea/Coffee	
10.00 - 10.45	Determination of Molecular Weight	(BJH)
10.45 - 11.30	NMR Spectroscopy	(JRE)
11.30 - 11.45	Tea/Coffee	
11.45 - 12.30	Thermal Analysis	(BJH)
12.30 - 13.15	IR/Raman Spectroscopy	(JRE)
13.15 - 14.00	Lunch	
14.00 - 14.45	Chromatographic Techniques	(BJH)
14.45 - 15.30	Other Techniques	(JRE)
15.30 - 15.45	Tea/Coffee	
15.45 - 16.30	Case Studies	(BJH/JRE)
16.30 - 17.00	Question and Answer session	
17.00	Close	

Module Objective

This course is designed as an introduction to the subject of polymer science and gives an overview of how this applies to a wide range of materials, processes, products and applications. If your company works with plastics, rubbers, adhesives, composites, coatings, fibres or packaging and requires some basic knowledge about polymeric materials, or have a requirement to analyse or characterise their behaviour, then this course will benefit you.

Part I of this course will give you an introduction to the science underlying the synthesis and processing of polymers, some basic information about their structures and properties and present some examples of their applications.

In Part II of the course you will learn about the range of modern instrumental techniques which can be used to analyse the structure and behaviour of polymeric materials. It will give a more detailed and in-depth view of some of the topics briefly presented in part I.

Delegates can attend either of these modules independently but they are designed to complement one another and to give a comprehensive introduction to Polymer Science

Polymer Chemistry – Module Programme

Presenters: Dr E.Khoshravi (EK) Dr R.Thompson(RT) Dr. L.Hutchings (LRH) Dr.N.Cameron(NRC)

09.30 - 10.00	Registration Welcome and Tea/Coffee	
10.00 - 10.35	Chain Growth	(NRC)
10.35 - 11.10	Step Growth	(NRC)
11.10 - 11.25	Tea/Coffee	
11.25 - 12.00	Transition Metal Mediated Polymer Chemistry	(EK)
12.00 - 12.35	Ring Opening Metathesis Polymerisation	(EK)
12.35 - 13.35	Lunch	
13.35 - 14.10	Dendrimers and Hyperbranched Systems	(LRH)
14.10 - 14.45	Solution Thermodynamics	(NC)
14.45 - 15.00	Tea/Coffee	
15.00 - 15.35	Controlled Chain Growth	(LRH)
15.35 - 16.10	Dilute Solution Dynamics	(NC)
16.10	Close/Questions	

Module Objective

This course builds upon the basic concepts of polymerisation introduced on day one. Synthetic techniques in common use in both academic and industrial laboratories for making a wide variety of polymers will be covered. Emerging methodologies that facilitate greater control over the final product, and as a consequence enable novel polymer architectures, will also be considered. The gap between polymer chemistry and polymer physics will be bridged by the introduction of some important thermodynamic concepts that permit the behaviour of polymers to be understood.

If your company works with plastics, rubbers, resins, adhesives, composites, coatings, fibres or packaging, a good understanding of polymer chemistry will benefit you. This course will give you a deeper understanding and a good overview of the different aspects of polymer chemistry.

Polymer Engineering – Module Programme

Presenters: Dr M.T. Martyn (MTM) Dr A.L. Kelly (ALK)
Dr L. Mulvaney-Johnson (LMJ) Dr R. Patel (RP)
Dr P. Caton-Rose (PCR) Dr J. Sweeney (JS)

09.10 - 09.30	Registration Welcome and Tea/Coffee	
09.30 - 09.40	Welcome Introduction	(MTM)
09.40 - 10.25	Flow Behaviour of Polymer Melts	(MTM)
10.25 - 11.10	Extrusion Processing	(ALK)
11.10 - 11.20	Tea/Coffee	
11.20 - 12.05	Injection Moulding Technology	(LMJ)
12.05 - 12.50	Solid Phase Deformation Processing	(JS)
12.50 - 13.30	Lunch	
13.30 - 13.50	Laboratory Demonstration	(MTM)
13.50 - 14.10	Laboratory Demonstration	(MTM)
14.10 - 14.30	Laboratory Demonstration	
14.30 - 14.50	Laboratory Demonstration	
14.50 - 15.10	Tea/Coffee/Questions	
15.10 - 15.55	Computer Modelling of Melt Processing	(PCR)
15.55 - 16.40	Coating Technology	(RP)
16.40 - 17.00	Close/Questions	

Modules Objectives

The course is designed to introduce participants to established engineering principles underlying the conversion of polymer raw material to useful product. The course aims to bridge theoretical perspectives of polymer melt flow with practical experience. The course will cover both melt and solid state processing characteristics of polymers and demonstrate how these influence the choice of processing technologies used by industry. Computer modelling of process flows will also be covered.

This module will be held at Bradford University to allow demonstrations on the equipment there.

Polymer Physics – Module Programme

Presenters: Professor T.C.B. McLeish (TCBM) Dr A. Voice (AV)
Dr D. Adolf (DA) Dr M. Ries (MR)
Professor R.A.L. Jones (RALJ) Dr S. Harris (SH)
Dr E. Sivaniah (ES)

09.15 - 09.45	Registration Welcome and Tea/Coffee	
09.45 - 10.30	Rheology	(TCBM)
10.30 - 11.15	Solid Polymers Mechanical Properties	(AV)
11.15 - 11.30	Tea/Coffee	
11.30 - 12.15	Basic Polymer Theory	(TCBM)
12.15 - 13.00	Molecular Characterisation 1 (SLS, DLS)	(DA)
13.00 - 13.30	Lunch	
13.30 - 14.15	Molecular Characterisation 2 (NMR)	(MR)
14.15 - 15.00	Polymers in Solution (Gels, Polyelectrolytes)	(ES)
15.00 - 15.15	Tea/Coffee	
15.15 - 16.00	Polymers at Surfaces	(RALJ)
16.00 - 16.45	Biopolymers	(SH)
16.45	Close/Questions	

Module Objectives

This course is designed to be an introduction to Basic Polymer Physics, and will be complementary to those of Basic Polymer Science, Polymer Characterisation, Polymer Chemistry and Polymer Engineering. It will be a course covering a wide range of topics in polymer physics: amorphous polymers, crystalline polymers, characterisation, viscoelasticity, polymer rheology, and oriented polymers. It will be appropriate for those members of the general polymer community wishing to get an update of the current state of polymer physics.

Multi-Phase Polymer Materials And Composites – Module Programme

Presenters: Dr P. Hine (PJH) Professor F. Jones (FRJ)
Professor C. Soutis (CS)
Professor T. McGrail (TM)

09.30 - 10.00	Registration and Welcome	
10.00 - 10.30	What is a fibre composite and multiphase polymeric material? (PJH)	
10.30 - 11.30	Fibre Composites – Rigidity	(FRJ)
11.30 - 11.40	Coffee	
11.40 - 12.30	Fabrication Routes to Fibre Composites	(FRJ/PJH)
12.30 - 13.15	Phase Separated Matrix Resins for Composites	(TM)
13.15 - 13.45	Lunch	
13.45 - 14.30	Particulate Reinforcements and Nano Composites	(PJH)
14.30 - 15.15	Continuous Fibre Composites: Strength	(FRJ)
15.15 - 15.30	Tea/Coffee	
15.30 - 16.00	Applications Workshop	(CS/SAH)
16.00 - 16.30	Round Table Discussion/further case study	
16.30	Close	

Module Objectives

This one day course is designed as an introduction to multiphase polymer materials and polymer based composites for newcomers to the subject. The course will cover the basic ideas of composite materials, of obtaining a material which improves on the properties of its constituents. Topics covered will include the reinforcement shape/type (continuous, discontinuous fibres, particulates), reinforcement size (the important emerging area of nanocomposites), matrix type (thermoplastic or thermoset), different processing routes (from hand lay-up to injection moulding) and composites where both phases are polymeric. The important area of mechanics of composites will also be covered, including aspects such as mixing rules, damage mechanisms and interfaces.

This course is specifically for you if: you are new to this technical area and want a basic grounding in polymer based composite materials; interact with polymer scientists (either as customers, suppliers or research and development teams); or if you are commercial/engineering/product based and need to understand more about how your products and processes work.

Polymer Dynamics And Macromolecular Rheology – Module Programme

Presenters: Professor T.C.B. McLeish and Professor P.D. Olmsted

09.30 - 10.00 Registration Welcome and Tea/Coffee

10.00 - 10.45 Fundamentals of Polymer Molecular Rheology

10.45 - 11.30 The Rouse Model and Results

11.30 - 11.45 Tea/Coffee

11.45 - 12.30 Polymer Solutions and Hydrodynamics

12.30 - 13.30 Lunch and Demonstrations

13.30 - 14.15 Surfactant Systems

14.15 - 15.00 Entangled Dynamics and Complex Architecture Molecules

15.00 - 15.15 Tea/Coffee

15.15 - 16.00 Applications of Controlled Rheology

16.00 Workshop/Discussions

Module Objective

A course aimed at industrial scientists interested in molecular formulations/rheology/controlled processing in plastics/surfactant fluids.

The module covers the basic physics of polymer dynamics and rheology, aimed at assisting projects that design formulations of polymer-containing fluids with controlled flow, adhesion or lubrication. The applications section can be tailored to individual audiences. Mathematical content is kept to a minimum, but useful scaling formulae are derived.

Polymeric Biomaterials – Module Programme

Presenters: Dr S. Rimmer

09.30 - 10.00	Registration Welcome and Tea/Coffee
10.00 - 11.00	Current Polymeric Biomaterials in the Field
11.00 - 11.15	Tea/Coffee
11.15 - 11.45	Synthesis and Fabrication 1–Polyurethanes, Polyesters, Polyamides
11.45 - 12.15	Synthesis and Fabrication 2–Acrylics, Vinyls and Hydrogels
12.15 - 12.45	Synthesis and Fabrication 3–Low Surface Energy Materials (Polysiloxanes and Fluoropolymers)
12.45 - 14.00	Lunch
14.00 - 14.30	Synthesis and Fabrication 4–Plasma Polymerisation and Surface Treatments
14.30 - 15.00	Introduction to Biointeractions
15.00 - 15.30	Studying Biointeractions
15.30 - 15.45	Tea/Coffee
15.45 - 16.15	Surface Analysis of Polymeric Biomaterials
16.15 - 16.45	Introduction to Biodegradation
16.45 - 17.15	Emerging Fields-Polymers in Tissue Engineering and Drug Delivery
17.15	Close/Questions

Module Objective

The course will overview the types of synthetic materials used in medical applications of polymers. We begin with an overview of the field by covering the types of applications that polymeric biomaterials are used in today. We then look in detail at the various classes of materials considering aspects of their synthesis, fabrication and properties that make them suitable for medical applications. Characterization of the interface between the biological system and the synthetic material is a vital area of consideration so we will consider the techniques that we have available to examine these biointeractions. Finally we will consider emerging areas of medical technology that are becoming more reliant on polymers: we consider the current approaches and briefly highlight some of the state-of-the-art newer systems.

Polymer Nanotechnology – Module Programme

Presenters: Professor A.J. Ryan (AJR)
Professor R.A.L. Jones (RALJ)

09.30 - 10.00	Registration Welcome and Tea/Coffee
10.00 - 10.15	Welcome and Introduction
10.15 - 10.45	Introduction and Context
10.45 - 11.15	Synthesis of Controlled Architecture Polymers
11.15 - 11.30	Tea/Coffee
11.30 - 12.00	Characterisation of Morphology
12.00 - 12.30	Block Copolymers 1
12.30 - 13.00	Polymer Surfaces and Interfaces
13.00 - 13.30	Lunch
13.30 - 14.00	Block Copolymers 2
14.00 - 14.30	Polymer Electronics
14.30 - 15.00	Polymer Photonics
15.00 - 15.15	Tea/Coffee
15.15 - 15.45	Responsive Systems
15.45 - 16.15	Summary and Outlook
16.15	Close/Questions

Module Objectives

This course is designed to introduce the subject of polymer nanotechnology and gives an overview of how this applies to a wide range of nanotechnology applications. It will demonstrate how this knowledge can be used to better develop new nanotechnology devices, processes and new business opportunities.

Polymer Science & Technology – 9 Day Modular Course

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Please register me for the above 9 day modular course

Name:

Organisation:

Address:

.....

Tel: Fax:

e-mail:

Please tick as appropriate. You may attend the whole 9 days or alternatively select the daily options.

- Polymer Science and Technology – 9 Day course (Course fee £1995)
- Day 1 - Basic Polymer Science Part I (Course fee £320)
- Day 2 - Basic Polymer Science part II (Course fee £320)
- Day 3 - Polymer Chemistry (Course fee £320)
- Day 4 - Polymer Engineering (Course fee £320)
- Day 5 - Polymer Physics (Course fee £320)
- Day 6 - Multiphase Polymer Materials & Composites (Course fee £320)
- Day 7 - Polymer Dynamics & Macromolecular Rheology (Course fee £320)
- Day 8 - Polymeric Biomaterials (Course fee £320)
- Day 9 - Introduction to Polymer Nanotechnology (course fee £320)

The above fees are not subject to VAT

Price on application for reduction of fees for multiple days or multiple delegates

I prefer to pay by **cheque** **credit card** or **bank transfer**

Further details provided upon receipt of booking

Please return this slip (or send details) to:

Miss S.H. Cowley The Polymer Centre, Dainton Building, University of Sheffield,
Sheffield S3 7HF (Tel: 0114 222 9520)

Or fax to 0114 222 9389 or e-mail details to s.h.cowley@sheffield.ac.uk

A charge of 25% will be made for cancellations received after 1st October 2007

