

REPORT OF THE REGIONAL MEETING ON MATERIALS SCIENCE RESEARCH AND FACILITIES, 1994

Introduction

In the fall of 1994, scientists and engineers in the region with interests in materials science were asked to meet informally to discuss research interests. The meeting was held December 13, 1994, at the Department of Chemistry, Dalhousie University.

Materials Science in Nova Scotia

Twenty seven participants from ten departments representing four institutions attended the meeting. From further expressions of interest, this could be estimated to represent about 50% of the materials scientists in the region. Although it is difficult to categorize materials research, especially since it can be done in terms of materials and in terms of properties, some attempt at categorization has been made, if only to provide key-words. Of course, direct contact with the researchers themselves will be the best means to obtain complete information. For that reason, researchers' names are provided (parenthetically in CAPITAL LETTERS), and complete contact information is given in the Appendix. Headings and subheadings are alphabetically ordered, with no attempt to quantify the level of activity in any given area.

Research Interests

Ceramics and Composites:

- Composite and ceramic analysis (CLARKE and MACKAY)
- Grain growth (PACEY)
- Microgravity (KAZI)
- Metal matrix composites (KIPOUROS)
- Modelling (TAHERI)
- Slip casting (KAZI, PACEY, YEMENIDJIAN)
- Sol-gel processes (KAZI)
- Zirconia and other solid electrolytes (PACEY)

Chemical Synthesis:

- Synthesis and characterization; new developments in structure and bonding; organometallic and coordination chemistry (BURFORD)

Crystal Growth:

- Crystal growth of semiconductors (GELFANDBEIN, LABRIE, OLSON, YEMENIDJIAN)
- Theory (DAS)

Electronic, Electrical and Electrochemical Properties:

- Cathodic protection (HYATT)
- Corrosion (MACINTYRE, RICHTER)
- Electron correlation and density (BOYD)
- Ionic and electronic conductivity (PACEY)

Magnetic Properties:

- Magnetic materials (KIPOUROS)
- Magnetic domains (BLACKFORD, JERICHO)
- Orientation dependence of nmr parameters (WASYLISHEN)

Mechanical Properties:

- Experimental investigations of response of structure and materials, e.g. adhesives (TAHERI)
- Fracture mechanics (HYATT)
- Indentation studies (BLACKFORD, JERICHO)
- Mechanical properties (SZABO)
- Testing (MACINTYRE, RICHTER)

Metallurgy:

- Analysis (CLARKE, MACKAY)
- Metallurgy (HYATT)

Microgravity:

- Ceramics and composites (KAZI)
- Crystal growth of ternary semiconductors (LABRIE, YEMENIDJIAN)
- Theory of crystal growth in microgravity (DAS)

Modelling and Calculations:

- Computational modelling of engineered materials, structural components and processes (e.g. plasma spray modelling) using finite element method (TAHERI)
- Finite element analysis of simulated structures (KAZI)
- Modelling of cathodic protection (HYATT)
- Molecular dynamics simulations, especially of molecular liquids, e.g. water (KUSALIK)
- Quantum chemistry (e.g. energetic materials), surface chemistry, reaction mechanisms and dynamics (BOYD)
- Theory of crystal growth in microgravity, diffusive processes (DAS)

Optical Properties:

- Second-harmonic generation in electro-optic crystals (PATON)

Other areas:

- Automated inspection (HYATT)
- Fire protection (SZABO)
- Forensics (MACINTYRE, RICHTER)

Other systems:

- Inorganic materials (BURFORD, WASYLISHEN)
- Orientationally disordered materials (WASYLISHEN, WHITE)
- Polymers (SZABO)

Semiconductors:

- Crystal growth of semiconductors (GELFANDBEIN, LABRIE, OLSON, YEMENIDJIAN)
- Analysis (CLARKE, MACKAY)

Surfaces and Coatings:

- Coatings (SZABO)
- Deposition of coatings for space, medical and dental applications (PASS)
- In situ* high-resolution experimental studies of surfaces (smaller than 5mm), surface roughness (BLACKFORD, JERICHO)

Thermal Properties:

- Heat capacity, thermal conductivity, phase transitions (WHITE)
- Thermal analysis (SZABO)

Research Equipment:

- Acoustic characterization (SZABO)
- Arc plasma deposition of coatings (GELFANDBEIN, OLSON, PASS)
- Ceramic fabrication equipment (LABRIE)
- Ceramic processing (KAZI)
- Chemical vapour deposition (PACEY)
- Cold press and powder preparation (KIPOUROS)
- Computational facilities: Stellar GS 2500 vector processor and IBM RS/6000 models 355 and 580 (BOYD)
- Corrosion testing facilities (HYATT)
- Densitometers (KIPOUROS)
- Dielectric equipment (WHITE)
- Electron microprobe and image analysis for rapid non-destructive quantitative chemical analysis of minerals, glasses and metals in grains as small as 5 μm , elements from O to U (MACKAY, CLARKE)
- Environmental testing (KAZI)
- Erosion testing (KAZI)
- Floating-zone crystal growth equipment (LABRIE)
- Furnaces (KIPOUROS, YEMENIDJIAN)
- Glove boxes (BURFORD, KAPOUROS, YEMENIDJIAN)
- Heat capacity calorimeters (WHITE)
- Infrared spectrometers (BURFORD, LABRIE, SZABO)
- Laser sources from 331 nm to 1550 nm (PATON)
- Laser writing (PATON)
- Mass spectrometry: CEC 21-110 mass spectrometer and VG Quattro triple quadrupole mass spectrometer (GROSSERT)
- Metallographic preparation facilities (HYATT)
- Metallography equipment (KAPOUROS)
- Mechanical strength and hardness (HYATT, KAZI, KIPOUROS)
- Nuclear magnetic resonance (nmr) spectrometers: MSL-200 nmr spectrometer and AMX-400 nmr spectrometer (WASYLISHEN)
- Optical benches (PATON)
- Pyrolysis-Gas chromatography/Mass spectrometry (SZABO)
- Raman spectrometers (BURFORD, KIPOUROS)
- Reactor for powder production (KAZI)
- Resistivity and Hall effect equipment (LABRIE)
- Rheometers (KIPOUROS)
- Scanning electron microscope (KIPOUROS)
- Scanning tunneling microscopy and atomic force microscopy (BLACKFORD, JERICHIO)
- Slip casting equipment (YEMENIDJIAN)
- Thermal analysis: DMA, TGA, DSC, Dielectric (SZABO); DSC (WHITE)
- Thermal conductivity equipment (WHITE)
- Thin film deposition (LABRIE)
- Viscometers (KIPOUROS)
- X-Ray powder diffraction (LABRIE, SZABO)

Acknowledgements

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Appendix

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