1.0 Introduction

Authorization for the Institute of Materials Processing is effective beginning January 1, 2004 and extending through December 31, 2009. This is a year longer than normal, but a six year authorization for this well-established institute will reduce the number of centers/institute up for reauthorization by MTU at the end of 2008.

2.0 Vision

The Institute of Materials Processing will be a great place for innovative researchers from various disciplines to do research and development. The Institute will be a nationally and internationally recognized leader in developing commercially-oriented minerals, materials and energy technologies. The Institute will assist academic departments in graduate and undergraduate education through research activities and actively participate in outreach programs. The Institute will be financially self-sufficient through various means including sponsored research, overhead return, royalties, donations, outreach programs, and external operations. The Institute will become a hub of sponsored government and industrial research which can help promote and expand materials (including minerals) and energy related activities across campus by involving faculty and researchers in the related fields.

3.0 Mission

The IMP mission is to conduct research and development for government and industries and for the benefit of society while supporting the graduate, undergraduate, and outreach missions of the University, specifically:

a) IMP will supply researchers at MTU with an organized structure capable of extending our current growth in materials and energy related disciplines, including strong support for cross-unit projects;
b) IMP will serve as a strong focus on campus for large scale, multi-disciplinary research which frequently involves pilot plant and technology transfer activities;
c) IMP will support interdisciplinary graduate and undergraduate education through opportunities in materials and energy related research and activities;
d) IMP will provide continuing education and services in the related areas;
e) IMP will actively pursue external funding opportunities;
f) IMP will encourage innovative research and spin-offs.

4.0 Governance Structure and Management

4.1 Director

The Director of the Institute of Materials Processing is responsible for the overall operation of the IMP. The IMP Director will make decisions on whether proposals or projects should be designated as Institute of Materials Processing proposals or projects. The Director will serve a five year term, with possibility for renewal. The IMP Executive Committee will appoint the Director.
The current director of the IMP is Dr. Jiann-Yang (Jim) Hwang. He was appointed to this position following a campus-wide search in April 1993.

4.2 Participants
All Michigan Tech faculty and staff that are interested in developing materials, materials processing technologies, and energy related activities can be part of the Institute of Materials Processing.

4.3 Executive Committee
The Executive Committee advises the Director and helps to ensure that the objectives of IMP are met. Members of the Executive Committee include researchers with active IMP projects with budgets totaling more than $200,000 per year.

4.4 Annual Report
The Director, with input from the Executive Committee, will prepare an annual report of IMP activities for the Vice President for Research at the end of each academic year.

4.5 Governance Document Review
All IMP participants will review this governing document annually. The Director, the person to whom the Director reports, and the MTU VP for Research must approve any changes.

5.0 Measures of Success
The measures of success will include:
1. Amount of external research dollars generated by Institute researchers.
2. Number of doctoral students generated by Institute faculty.
3. Number of publications generated by Institute researchers.
4. Number of students impacted by Institute educational programs.
5. Financial value to the University, calculated by:
   (Indirects staying with university in the future + graduate tuition paid in the future – cost share needed in the future.) ≥
   (Indirects staying with the university now + graduate tuition paid now – cost share needed now.)
REPORT DATA
In Fiscal Year 2009, at least fourteen proposals were submitted through the Institute of Materials Processing. Of these proposals, five have been funded (three in FY09, two in early FY10), the remainder have been rejected. There were eleven active projects in FY09.

Total research expenditures on IMP projects in FY09 were $616,551. Total overhead generated by IMP projects in FY09 was $187,269.48, up from $151,398.83 in FY08. Spending of the Institute portion of incentive return is detailed at the end of this report.

Director: Jim Hwang
Faculty (MSE): Jaroslav Drellich
Calvin White
Yun Hang Hu
Douglas Swenson
Stephen Hackney
Paul Sanders
Mark Plichta

Associated Faculty: Gerard Caneba, ChEng
Roger Turpening, GMES
Amir Jalali Roudsar, Physics
Marta Wloch, Chemistry
Song-Lin Yang, MEEM
Franz Tanner, Math
Kathleen Feigl, Math
Xinli Wang, Computer Science

Research Staff: Xiaodi Huang
Allison Hein
Shangzhao Shi
Bowen Li
Xiang Sun
J. Murray Gillis

Visiting Researchers: Indraneel Tembhre
Parn Banerjee
Sayed ELNakhely
Changming Wang
Xuan Li
Shuqian Xie

Graduate Students: Matthew Andriese, Daniel Hoffman, Zhiwei Peng, Chienyu Wen, Wayne Bell, Zheng Zhang, Shangzhao Shi

PhD Graduates: Bowen Li, Xiang Sun
PATENTS and DISCLOSURES


“Exfoliated copper vermiculite antimicrobial additive”, Michigan Tech File #0935.00 (2009)

PROJECTS active in FY09

<table>
<thead>
<tr>
<th>Principal Investigator (Department) / coPIs</th>
<th>Project</th>
<th>Sponsor / start and end dates</th>
<th>Proposal No. / Indexes</th>
<th>Total Budget (includes Cost Share)</th>
<th>FY09 Expenditures (includes Cost Share)</th>
<th>FY09 Total Overhead Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.Y. Hwang (MSE) / J. Drellich, Y. Hu</td>
<td>Dry Separation of Nickel and Copper Bearing Minerals</td>
<td>Kennecott Minerals Co. / February 25, 2008 to May 31, 2008</td>
<td>#080267 / E26404</td>
<td>$27,760</td>
<td>8,478.21 (FFP unexpended balance transferred out)</td>
<td>3,043.46</td>
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<tr>
<td>J.Y. Hwang</td>
<td>Various Sponsored</td>
<td>Various Sponsored / FY08</td>
<td>E28675</td>
<td></td>
<td>76.26</td>
<td>27.38</td>
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<tr>
<td>Principal Investigator (Department) / coPIs</td>
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<td>Sponsor / start and end dates</td>
<td>Proposal No. / Index(es)</td>
<td>Total Budget (includes Cost Share)</td>
<td>FY09 Expenditures (includes Cost Share)</td>
<td>FY09 Total Overhead Generated</td>
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<tr>
<td>------------------------------------------</td>
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<tr>
<td>X. Huang (MSE) / J.Y. Hwang</td>
<td>Robust, Low-Cost Membranes for Hydrogen Production from Coal-Derived Syngas</td>
<td>Aspen Products Group (DOE SBIR Phase II) / October 31, 2007 to July 31, 2009</td>
<td>#070409 / E25586</td>
<td>$95,842.93</td>
<td>48,702.32</td>
<td>17,482.87</td>
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<td>C. White (MSE)</td>
<td>Al-Mg-Si-Mn Alloys</td>
<td>Hydro Aluminum AS / August 1, 2006 to August 31, 2008</td>
<td>#041122P2 / E26363, E26364</td>
<td>$213,815.56</td>
<td>35,197.18 (FFP unexpended balance transferred out)</td>
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<td>M. Plichta (MSE)</td>
<td>Analytical Support for Concurrent Production of Syngas and Steel</td>
<td>UP Steel (US DOE SBIR Ph1) / June 30, 2008 to March 29, 2009</td>
<td>#071137 / E25956</td>
<td>$21,791.05</td>
<td>21,971.05</td>
<td>7,822.43</td>
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<td>M. Plichta (MSE)</td>
<td>Process Optimatation of Energy Efficient Steel Production</td>
<td>UP Steel (MPSC MEEG) / November 6, 2008 to September 30, 2010</td>
<td>#080463 / E28964</td>
<td>$437,820</td>
<td>87,221.34</td>
<td>31,310.22</td>
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<tr>
<td>J. Drelich (MSE)</td>
<td>Mineral Recovery of Copper Mine Tailings on Lake Superior Coastline for Use as Raw material in the Manufacture of Roof Shingles</td>
<td>Lesktech Ltd (EPA Phase 2 SBIR) / May 1, 2008 to November 30, 2009</td>
<td>#071032 / E26058</td>
<td>$30,000</td>
<td>19,321.46</td>
<td>6,935.9</td>
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<td>J. Drelich (MSE)</td>
<td>Flotation Tests to Recover Gold from Actinolite Greenschist Rock</td>
<td>Green Rock Project LLC / February 15, 2008 to June 30, 2008</td>
<td>#080146 / E26401</td>
<td>$9,887</td>
<td>5,396.04 (FFP unexpended balance transferred out)</td>
<td>1,937.04</td>
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<tr>
<td>Principal Investigator (Department) / coPIs</td>
<td>Project</td>
<td>Sponsor / start and end dates</td>
<td>Proposal No. / Index(es)</td>
<td>Total Budget (includes Cost Share)</td>
<td>FY09 Expenditures (includes Cost Share)</td>
<td>FY09 Total Overhead Generated</td>
</tr>
<tr>
<td>------------------------------------------</td>
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<tr>
<td>J. Drellich (MSE) / C. White</td>
<td>Mechanical Properties of Novel Resin-Fiber Composites</td>
<td>Great Lakes Composites (DOD SBIR Ph1) / March 1, 2008 to July 31, 2008</td>
<td>#070916 / E26046</td>
<td>$20,000</td>
<td>8,445.38 (FFP unexpended balance transferred out)</td>
<td>3,264.16</td>
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<tr>
<td>J. Drellich (MSE) / J.Y. Hwang, Y. Hu</td>
<td>Laboratory Tests on Recovery of Rare Earth Oxides from Phosphate/Silicate-Type Ore</td>
<td>Great Western Minerals Group Ltd. / April 21, 2008 to September 30, 2008</td>
<td>#080412 / E26414</td>
<td>$81,000</td>
<td>70,940.62 (FFP unexpended balance transferred out)</td>
<td>25,465.84</td>
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</table>

**PROPOSALS submitted in FY09 (not including active projects shown previously)**

Title: Fabricate Glass Samples  
Funding Source: Savannah River National Lab  
Anticipated start date: April 1, 2009  
Duration: 0.5 years  
Total budget: $6,000  
Pl: X. Huang  
coPIs: none  
Status: Funded

Title: Catalytic Activation, Spillover, and Storage of Hydrogen on Transition-metal/MOFs  
Funding Source: NSF  
Anticipated start date: Sept 1, 2009  
Duration: 3 years  
Total budget: $302,650  
Pl: Y.H. Hu  
coPIs: none  
Status: Funded
Title: Center for Integrated Energy and Material Systems
Funding Source: US DOE
Anticipated start date: Sept 1, 2009
Duration: 5 years
Total budget: $24,849,613
Pl: J.Y. Hwang
cOPIs: J. Drellich, Y. Hu, G. Caneba, R. Turpening
Status: Declined

Title: PIRE: International Partnership on Microwave Processing of Materials: From Science to Entrepreneurship
Funding Source: NSF pre-proposal
Anticipated start date:
Duration: 5 years
Total budget: $3,721,824
Pl: J. Drellich
cOPIs: J.Y. Hwang, M. Raber, P. Nelson
Status: Declined

Title: Local and Global Interactions in Systems Involving Mosaic Surfaces
Funding Source: NSF
Anticipated start date:
Duration: 3 years
Total budget: $623,022
Pl: J. Drellich
cOPIs: K. Feigl, F. Tanner
Status: Declined

Title: Design and Evaluation of a Novel Process Strategy for Water and Energy Conservation in the Oilsand Processing Industry
Funding Source: Canadian Oil Sands Network for Research & Development
Anticipated start date:
Duration: 2 years
Total budget: $341,528
Pl: J.Y. Hwang
cOPIs: J. Drellich
Status: Declined

Title: Demonstration of Cost-Competitive CTL Technology
Funding Source: UP Steel (DARPA)
Anticipated start date:
Duration: 1 years
Total budget: $186,035
Pl: J. Drellich
cOPIs: none
Status: Declined
Title: Restoration of Waste Carbon Black – Left Behind Fertilizer Industry – for Use in Printing Inks and Paints Application
Funding Source: NSF – US-Egypt program
Anticipated start date: 
Duration: 2 years
Total budget: $ 68,420
PI: J.Y. Hwang
coPIs: none
Status: Declined

Title: Utilization of Opportunity Fuel in the Steel Industry – Combined SNG Production
Funding Source: US DOE
Anticipated start date: 
Duration: 3 years
Total budget: $ 1,718,167
PI: X. Huang
coPIs: J.Y. Hwang, J. Drellich
Status: Declined

Title: Mapping Charge Domains at the Bitumen-Water Interface using Surface Charge Microscopy with a Nanoscale Resolution
Funding Source: American Chemical Society, Petroleum Research Fund
Anticipated start date: 
Duration: 2 years
Total budget: $ 135,080
PI: J. Drellich
coPIs: J.Y. Hwang
Status: Declined

Title: Tuning Composition, Structure and Hydrogen Storage Performance of Non-Stoichiometric Lithium Imides
Funding Source: NSF
Anticipated start date: 
Duration: 3 years
Total budget: $ 299,651
PI: Yun Hang Hu
coPIs: none
Status: Declined

PAPERS PUBLISHED (2008-2009)


### in E35423 - O/H Incentive - IMP Center

<table>
<thead>
<tr>
<th>Item</th>
<th>FY09</th>
<th>Comments for FY09</th>
<th>FY10 to 11/10/09</th>
<th>Comments for FY10</th>
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<tbody>
<tr>
<td>Carryforward from FY08</td>
<td>$ 15,631.99</td>
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<td>$ 16,027.29</td>
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<td>Analytical Services</td>
<td>500.50</td>
<td>Act Labs</td>
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<td>Library Binding Services</td>
<td>240.56</td>
<td>Thesis: Li, Sun</td>
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<tr>
<td>Maintenance - Lab Equipment</td>
<td>6,100.00</td>
<td>Setaram - related to H2 project</td>
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<td>Mail Center Charges</td>
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<td>Print Shop</td>
<td>20.00</td>
<td>Li business cards</td>
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<td>Use charges</td>
<td>661.59</td>
<td>MSE equipment</td>
<td>993.04</td>
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<td>Other IntraUniv charges</td>
<td>130.00</td>
<td>ProQuest Fee for Li and Sun?</td>
<td>59.84</td>
<td>computer recycling</td>
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<td>Payroll advance</td>
<td>15.00</td>
<td>Andriese</td>
<td></td>
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</tr>
<tr>
<td>Poster Printing</td>
<td>53.96</td>
<td>Peng</td>
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<tr>
<td>Tuition Fellowship</td>
<td>13,409.00</td>
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<td>Chem Stores</td>
<td>186.86</td>
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<td>477.88</td>
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<tr>
<td>Computer software</td>
<td>1,780.00</td>
<td>Instron, used FFP unexp balance</td>
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<tr>
<td>Gases</td>
<td>592.28</td>
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<td>818.32</td>
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<tr>
<td>Chemicals, lab supplies, minor equipment</td>
<td>1,972.80</td>
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<td>2,210.50</td>
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<tr>
<td>Travel</td>
<td>5,271.84</td>
<td>Hwang, Shi, visitor, other minor</td>
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<tr>
<td>Temp Faculty 10% FB: Sun</td>
<td>5,714.27</td>
<td>173.70 hrs</td>
<td>3,427.81</td>
<td>104.18 hrs</td>
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<tr>
<td>FT Admin Prof: Hein</td>
<td>7,115.08</td>
<td>270 hrs, -13%</td>
<td>791.81</td>
<td>29.29 hrs, -4%</td>
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<td>FT Admin Prof: Huang</td>
<td>361.01</td>
<td>10 hrs</td>
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<td>FT Admin Prof: Shi</td>
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<td>Temp Clerical/ Tech 10% FB: Hill</td>
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<td>53.87 hrs</td>
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<td>Temp Clerical/ Tech 10% FB: Visiting scholars</td>
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<td>Banerjee and Tembire</td>
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<td>Grad hourly (P541H)</td>
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<td>Andriese</td>
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<td>Undergrad (P541)</td>
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<td>Fringes</td>
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<td>Total Annual Expenditures</td>
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<td>$ (7,069.75)</td>
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<td>Transfer out to D95230</td>
<td>(3,000.00)</td>
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<td>Transfer out to E34625 GACS support</td>
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<td>unexpended balance</td>
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<td>Jun 08, Sept 08, Dec 08, Mar 09</td>
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<td>Jun 09, Sept 09</td>
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<td>$ 2,815.42</td>
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### in D95230 - IMP Administration

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<th>FY10 to 11/10/09</th>
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<td>Misc Services - snow plowing at Granters bldg</td>
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<td>McAfee software charges</td>
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<td>IT Telephone line charges</td>
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<td>IT Network charges</td>
<td>1,605.84</td>
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<td>Mail Center Charges</td>
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<td>IT Telephone local calling charges</td>
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<td>IT Telephone long distance calling charges</td>
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<td>Ending balance</td>
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