Current Status and Future Plans of Industrial Science Support Center (ISSC)

Docheon Ahn
(Head of ISSC, PAL)

November 13, 2023
Organization & Mission of Industrial Science Support Center (ISSC)

- **Organization**
  - Establishment in October 2013
  - Reorganization in January 2023

- **Mission**
  - PAL, dedicated to supporting the academic Science
  - Platform service to provide synchrotron science to industry
  - Connecting **industry science needs** to **staff scientists** with expertise in various research fields
Organization of Industrial Science Support Center (ISSC)

- **Dedicated Industrial Science Support Group**
  - Composed of beamline scientists of PLS-II beamline department
  - For national key industries; Battery materials, Biomaterials, and Semiconductor
  - Necessary to be specialized and expand industrial application services to meet growing demands.

- **Dedicated Battery Science Support Group**

<table>
<thead>
<tr>
<th>Experts</th>
<th>Techniques</th>
<th>Analytical Information</th>
<th>Beamline</th>
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</thead>
<tbody>
<tr>
<td>Dr. D. Ahn</td>
<td>High-resolution powder Diffraction In-situ XRD</td>
<td>(In-situ) crystal structure &amp; micro-structure analysis</td>
<td>9A, 9B</td>
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<tr>
<td>Dr. H. Ahn</td>
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<tr>
<td>Dr. J. Lim</td>
<td>X-ray Transmission Imaging</td>
<td>(In-situ) surface/interface behavior &amp; structure analysis</td>
<td>6C, 7C</td>
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<tr>
<td>Dr. J. H. Lim</td>
<td>Computed Tomography XANES Imaging</td>
<td>for battery materials, cell volume change etc.</td>
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<tr>
<td>Dr. K. Lee</td>
<td>(In-situ) X-ray Absorption Fine Structure XANES, EXAFS</td>
<td>(In-situ) chemical states and electronic and geometric</td>
<td>8C</td>
</tr>
<tr>
<td>Dr. N. Sung</td>
<td></td>
<td>local structure analysis</td>
<td></td>
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<tr>
<td>Dr. N. Kim</td>
<td>Soft X-ray Nanoscopy &amp; Absorption Scanning Transmission X-ray Microscopy</td>
<td>Chemical states analysis of elements with spatial resolution</td>
<td>10A</td>
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<tr>
<td>Dr. Y. Kim</td>
<td>X-ray Absorption Fine Structure (Tender photon energy range)</td>
<td>Chemical states analysis of elements with tender energy (P,</td>
<td>1C</td>
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<td>S, Si)</td>
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Services offered

- **Urgent Service**
  - Offering urgent beamtime
  - Providing data within 10 days after sample measurement at beamline

- **Full Service**
  - Includes everything from experimental design, data collection, data analysis, and a detailed final report

- **Mail-in Service**
  - Prefer to skip the wait period of general proposal access and just send the samples for analysis

- **On-site Service**
  - Prefer to skip the wait period of general proposal access
  - Bring your samples and carry out your experiment

### Experiment Process of Academy & Industry at PLS-II

<table>
<thead>
<tr>
<th>General Proposal Access (Academy)</th>
<th>Proposal (3 times/year)</th>
<th>Review &amp; Assignment</th>
<th>Experiment (by users)</th>
<th>Analysis (by users)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5~8 months</td>
<td></td>
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<table>
<thead>
<tr>
<th>Quick Access (Industry)</th>
<th>Application (Anytime)</th>
<th>Meeting/Call/Email</th>
<th>Experiment (by PAL)</th>
<th>Analysis (by PAL)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2~4 weeks*</td>
<td></td>
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* Except during the summer and winter shutdown periods
Achievement of ISSC

- **Industrial Utilization and Achievement of ISSC Since 2014**
  - Depending on 1) the number of days of beamtime available to industry science
  - 2) staff scientist’s analytical support
  - 3) industry needs

![Annual Service Charge and Experiment Count](image)

- **COVID-19 pandemic period**
Achievement & Highlights of ISSC

- Industry utilization and achievements in July 2023
  - 10 experiments ($30,000 service charge)

**Battery Industry**
- Chemical/Oxidation state analysis of battery cathode materials using soft X-ray
- Precise crystal structure and micro structure analysis electrode materials for rechargeable batteries using HRPD

**Steel Industry**
- Evaluation of multiple phase transition and phase fraction according to cokes, alumina, and external air conditions using in-situ XRD during HT
- Evaluation of dispersion and single particle characteristics of Silica-Rubber Composite using SAXS

**Tire Industry**
- Evaluation of dispersion and single particle characteristics of Silica-Rubber Composite using SAXS

**Rubber Industry**
- Identification of unknown nanoparticles embedded in rubber using SAXS
Future Plans & Strategy

❖ Staff Scientist Support
- Industrial science support: PAL’s key mission, not just ISSC’s mission
- Therefore, perception change of all staff scientists and then voluntarily support not only academic user support but also industry users

❖ Industry Needs
- To cultivate industry needs and promote synchrotron science to the industry, our strategy includes corporate visits and exchanges, campaigns, and partnerships with companies.

➢ Three Elements of Expanding Industrial Science
- Quick Beamtime Access
- Staff Scientist Support
- Industry Needs
Future Plans & Strategy

Quick Beamtime for Industry Science

- It should need to increase the allocation of industry beamtime.
- Necessary to constantly persuade the government and Korean SR user’s association

Current Status
- 70% Public beamtime
- 30% Maintenance beamtime (beamline maintenance, experimental technique development, industry user support)

Future Plan
- 65% Public beamtime
- 25% Maintenance beamtime
- 10% Industry beamtime

Long-term Future Plan
- ??% Public beamtime
- ??% Maintenance beamtime
- ??% Industry beamtime

User Fields using PLS-II

<table>
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<tr>
<th></th>
<th>Public Beamtime</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>Academic Science</td>
<td>Industry</td>
</tr>
<tr>
<td>'21</td>
<td>1,825 (97.2%)</td>
<td>52 (2.8%)</td>
</tr>
<tr>
<td>'22</td>
<td>1,963 (96.4%)</td>
<td>73 (3.6%)</td>
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Thank You
For Your Attention