## Invited Speaker Biography

<table>
<thead>
<tr>
<th>Name</th>
<th>Prof./Dr. Chinho Park</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affiliation</td>
<td>Yeungnam University</td>
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<tr>
<td>Department</td>
<td>School of Chemical Engineering</td>
</tr>
<tr>
<td>Country</td>
<td>Republic of Korea</td>
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<tr>
<td>Topic</td>
<td>Nano Materials (Synthesis and Applications)</td>
</tr>
</tbody>
</table>

### Biography

#### Education
- 1981 B.S. in Chemical Engineering, Hanyang University
- 1983 M.S. in Chemical Engineering, Seoul National University
- 1992 Ph.D. in Chemical Engineering, University of Florida

#### Personal Experience
- 2014 New Growth Engine Project Leader, New & Renewable Energy Hybrid Systems Development
- 2013 Visiting Professor, Department of Materials Science & Engineering, Stanford University
- 2011-2012 National PV R&D Program Director, Korea Institute of Energy Technology Evaluation and Planning
- 2009 Visiting Professor, Department of Chemical Engineering, University of Florida
- 2014-Present Vice President for Research, Yeungnam University
- 1994-Present Professor, School of Chemical Engineering, Yeungnam University
- 1984-1992 Member of Technical Staff, Hyundai Electronic, Ind. Co. Ltd.

#### List of Research Collaborations
- 1994-2010 Electronic Materials Laboratory, Department of Chemical Eng., University of Florida
- 2010-Present ICube, University of Strasbourg, France
- 2014-Present CSP, Fraunhofer Institute Halle, Germany
Elucidation of formation mechanisms of pyrite (FeS$_2$) nano-crystals via colloidal route

Abstract (200-words)

Pyrite (FeS$_2$) nanocrystals (NCs) were synthesized in an excess sulfur environment via a colloidal route, and the phase change behavior of the iron sulfide compounds was investigated. As the growth time increased, the phase of the iron sulfide NCs transformed from mackinawite (FeS) via greigite (Fe$_3$S$_4$) to pyrite (FeS$_2$). Thus, Fe$_3$S$_4$ phases were considered as intermediate precursors on the pathway of FeS$_2$ phases in the reaction between FeS phases and excess sulfur. The elemental ratio of [S/Fe] increased from 1.1 to 2.1 during the phase change, and the shape of the NCs changed from a hexagonal nano-sheet (Fe$_3$S$_4$), via cubic (FeS$_2$), to a cubic-hedral structure (FeS$_2$). Strong absorption peaks in the UV-Vis spectra were observed in the FeS$_2$ phase, and its optical band gap was estimated to be $\sim$0.9 eV, indicating the semiconducting nature of pyrite. Synthesis of FeS$_2$ in sulfur abundant environment was found to be suitable to acquire pure semiconducting FeS$_2$ phases. The depletion of Fe-element after the formation of FeS$_2$ phases led to the decrease of intermediate phases and the gradual changes from intermediate phases to FeS$_2$ resulted in pure phases. Bulk hetero-junction solar cells were fabricated using the pyrites and their device properties characterized.