

Curriculum Vitae of Prof. Min Jae Ko

I. PERSONAL INFORMATION

A. Contact Information

Professor, Department of Chemical Engineering
Hanyang University

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B. Academic appointment at the Hanyang University (HYU)

Feb. 2017 – Present Full Professor, Department of Chemical Engineering, HYU

C. Previous Employments

Feb. 2008 – Jan. 2017 **Korea Institute of Science and Technology (KIST)** Seoul, Korea
Principal Research Scientist, Photo-Electronic Hybrids Research Center

Mar. 2015 – Jan. 2017 **Korea University** Seoul, Korea
KU-KIST Professor, KU-KIST Graduate School of Converging Science and Technology

Sep. 2009 – Jan. 2017 **University of Science and Technology (UST)**
Adjunct Professor, Department of Nanomaterials Science and Engineering

Jul. 2005 – Feb. 2008 **Samsung Electronics Company Co., LCD Business** Asan, Korea
Senior Engineer, HD LCD Center, Product Technology Team

Oct. 2001 – Sep. 2004 **Massachusetts Institute of Technology** Cambridge, MA, USA
Postdoctoral Associate (Advisor: Prof. Gregory. C. Rutledge)
Department of Chemical Engineering

D. Educational Background

Mar. 1997 – Aug. 2001 **Seoul National University** Seoul, Korea
Ph.D., School of Materials Science and Engineering
Dissertation: A Study on the Self-Assembly of Triblock Copolymers by
Computer Simulation (Advisor: Won Ho Jo)

Mar. 1995 – Feb. 1997 **Seoul National University** Seoul, Korea
M.S., Dept. of Fiber and Polymer Science
Dissertation: Phase Behavior of Chitosan with Different Degree of
Deacetylation/Polyamide 6 Blends (Advisor: Won Ho Jo)

Mar. 1991 – Feb. 1995

Seoul National University
B.S., Dept. of Fiber and Polymer Science (*Graduation with honors*)

Seoul, Korea

Honors and Awards

Researcher of the Month, HYU (May 2018)

GPVC Young Scientist Award, Global Photovoltaic Conference 2018 (March 14, 2018)

Award of Excellence for the “Scientists who will lead 100 key technologies of Korea in 2020” by the National Academy of Engineering of Korea (Dec. 19, 2013)

Young Scientist Award of 2012, Korea Research Council of Fundamental Science and Technology

KIST Young Fellow, 2013

Best Project Award of KIST, 2011, 2013 (Project Leader)

Best Research Team Award of KIST, 2011 (Project Leader)

Best Research Team Award of KIST, 2008, 2009

Six Sigma Best Practice Award, Samsung Electronics Co. LCD Business, 2007

Graduation with Honors, Seoul National University (Feb. 1995)

II. RESEARCH ACTIVITIES

List of Journal Publications

166. R. Riaz, M. Ali, T. Maiyalagan, A.A. Arbab, A.S. Anjum, S. Lee, **M.J. Ko*** and S.H. Jeong*, “Activated charcoal and reduced graphene sheets composite structure for highly electro-catalytically active counter electrode material and water treatment”, *International Journal of Hydrogen Energy*, Accepted.
165. H. Li, X. Chen, E. Zalnezhad*, K.N. Hui*, K.S. Hui*, and **M.J. Ko***, “3D hierarchical transition-metal sulfides deposited on MXene as binder-free electrode for high-performance supercapacitors”, *Journal of Industrial and Engineering Chemistry* **82**, 309-316 (2020).
164. R. Riaz, M. Ali, T. Maiyalagan, A.A. Arbab, A.S. Anjum, S. Lee, **M.J. Ko*** and S.H. Jeong*, “Enhanced photovoltaic performance of solution-processed Sb₂Se₃ thin film solar cells by optimizing device structure”, *Current Applied Physics* **20**(2), 282-287 (2020).
163. J.A. Lee, J.-Y. Kim, W. Kim, S.H. Kang*, and **M.J. Ko***, “Comparative Study on the Photoanode Nanoarchitectures for Photovoltaic Application”, *International Journal of Precision Engineering and Manufacturing-Green Technology* **82**, 309-316 (2020).
162. T. Jeong, S.-Y. Ham, B. Koo, P. Lee, Y.-S. Min*, J.-Y. Kim*, and **M.J. Ko***, “Transparent 3 nm-thick MoS₂ counter electrodes for bifacial dye-sensitized solar cells”, *Journal of Industrial and Engineering Chemistry* **80**, 106-111 (2019).
161. J. Kim, B. Koo, W.H. Kim, J. Choi, C. Choi, S.J. Lim, J.-S. Lee, D.-H. Kim, **M.J. Ko*** and Y. Kim*, “Alkali Acetate-Assisted Enhanced Electronic Coupling in CsPbI₃ Perovskite Quantum Dot Solids for Improved Photovoltaics”, *Nano Energy* **66**, 104130 (2019).

160. R. Riaz, M. Ali, H. Anwer, **M.J. Ko*** and S.H. Jeong*, “Highly porous self-assembly of nitrogen-doped graphene quantum dots over reduced graphene sheets for photo-electrocatalytic electrode”, *Journal of Colloid and Interface Science* **557**, 174–184 (2019).
159. M. Jo, S. Bae, I. Oh, J.-H. Jeong, B. Kang, S.J. Hwang, S.S. Lee, H.J. Son, B.-M. Moo, **M.J. Ko*** and P. Lee*, “3D Printer-Based Encapsulated Origami Electronics for Extreme System Stretchability and High Areal Coverage”, *ACS Nano* **13**, 12500-12510 (2019).
158. J.Y. Lee, S. Kang, D. Lee, S. Choi, S. Yang, K. Kim, Y.S. Kim, K.C. Kwon, S.H. Choi, S.M. Kim, J. Kim, J. Park, H. Park, W. Huh, H.S. Kang, S.W. Lee, H.-G. Park, **M.J. Ko**, H. Cheng, S. Han, H.W. Jang, and C.-H. Lee, “Boosting the photocatalytic hydrogen evolution performance via anatomically thin 2D heterojunction visualized by scanning photoelectrochemical microscopy”, *Nano Energy* **66**, 104053 (2019).
157. F. Mateen, M. Ali, S.Y. Lee, S.H. Jeong, **M.J. Ko*** and S.-K. Hong*, “Tandem structured luminescent solar concentrator based on inorganic carbon quantum dots and organic dyes”, *Solar Energy* **190**(15), 488-494 (2019).
156. H.S. Jung*, G.S. Han, N.-G. Park*, and **M.J. Ko***, “Flexible Perovskite Solar Cells”, *Joule* **3**(8), 1850-1880 (2019).
155. G.S. Han, J. Kim, S. Bae, S. Han, Y.J. Kim, O.Y. Gong, P. Lee, **M.J. Ko***, H.S. Jung*, “Spin-Coating Process for 10 cm x 10 cm Perovskite Solar Modules Enabled by Self-Assembly of SnO₂ Nanocolloids”, *ACS Energy Lett*, **4**(8), 1845-1851 (2019).
154. R. Riaz, M. Ali, T. Maiyalagan, A.S. Anjum, S. Lee, **M.J. Ko*** and S.H. Jeong*, " Dye-sensitized solar cell (DSSC) coated with energy down shift layer of nitrogen-doped carbon quantum dots (N-CQDs) for enhanced current density and stability Article”, *Applied Surface Science* **483**(31), 425-431 (2019).
153. R. Riaz, M. Ali, I.A. Sahito, A.A. Arabab, T. Maiyalagan, A.S. Anjum, **M.J. Ko*** and S.H. Jeong*, "Self-assembled nitrogen-doped graphene quantum dots (N-GQDs) over graphene sheets for superb electro-photocatalytic activity”, *Applied Surface Science* **480**(30), 1035-1046 (2019)
152. Y. Li*, L. Ma, Y. Yoo, G. Wang, X. Zhang, and **M.J. Ko***, “Atomic layer deposition: A versatile method to enhance TiO₂ nanoparticles interconnection of dye-sensitized solar cell at low temperature”, *Journal of Industrial and Engineering Chemistry* **73**, 351–356 (2019)
151. S. Bae, J.W. Jo, P. Lee*, and **M.J. Ko***, “Controlling the Morphology of Organic–Inorganic Hybrid Perovskites through Dual Additive-Mediated Crystallization for Solar Cell Applications”, *ACS Applied Materials & Interfaces* **11**, 17452–17458 (2019).
150. Y. Li*, L. Ma, Y. Yoo, G. Wang, X. Zhang, and **M.J. Ko***, “Atomic layer deposition: A versatile method to enhance TiO₂ nanoparticles interconnection of dye-sensitized solar cell at low temperature”, *Journal of Industrial and Engineering Chemistry* **73**, 351–356 (2019).

149. I. Jeong, J.W. Jo, S. Bae, H.J. Son* and **M.J. Ko***, “A fluorinated polythiophene hole-transport material for efficient and stable perovskite solar cells”, *Dyes and Pigments* **164**, 1-6 (2019).
148. J. Park, P. Lee*, and **M.J. Ko***, “Design and Fabrication of Long-Term Stable Dye-Sensitized Solar Cells: Effect of Water Contents in Electrolytes on the Performance”, *International Journal of Precision Engineering and Manufacturing-Green Technology*, **6**, 125-131 (2019).
147. J.S. Kang, J. Kang, D.Y. Chung, Y.J. Son, S. Kim, S. Kim, J. Kim, J. Jeong, M.J. Lee, H. Shin, S. Park, S.J. Yoo, **M.J. Ko**, J. Yoon, and Y.-E. Sung, “Tailoring the porosity of MOF-derived N-doped carbon electrocatalysts for highly efficient solar energy conversion”, *J. Mater. Chem. A*, **6**, 20170-20183 (2018).
146. J.W. Jo, Y. Yoo, T. Jeong, S. Ahn* and **M.J. Ko***, “Low-Temperature Processable Charge Transporting Materials for the Flexible Perovskite Solar Cells”, *Electronic Materials Letters* **14**, 657-658 (2018).
145. Y. Li*, X. Zhang, and **M.J. Ko***, “Direct Comparison of Electron Transport and Recombination Behaviors of Dye-Sensitized Solar Cells Prepared Using Different Sintering Processes”, *ACS Sustainable Chemistry & Engineering* **6**(5), 7193-7198 (2018).
144. J.-Y. Kim, Y.J. Jang, J. Park, J. Kim, J.S. Kang, D.Y. Chung, Y.-E. Sung, C. Lee, J.S. Lee* and **M.J. Ko***, “Highly loaded PbS/Mn-doped CdS quantum dots for dual application in solar-to-electrical and solar-to-chemical energy conversion”, *Applied Catalysis B: Environmental* **227**, 409-417 (2018).
143. J.S. Kang, J.-Y. Kim, J. Yoon, J. Kim, J. Yang, D.Y. Chung, M.-C. Kim, H. Jeong, Y.J. Son, B.G. Kim, J. Jeong, T. Hyeon, M. Choi*, **M.J. Ko***, and Y.-E. Sung*, “Room-Temperature Vapor Deposition of Cobalt Nitride Nanofilms for Mesoscopic an Perovskite Solar Cells”, *Advanced Energy Materials* **8**, 17031114 (2018). **(Selected as an Outside Front Cover Paper)**
142. J.S. Kang, J. Kim, J.-Y. Kim, M.J. Lee, J. Kang, Y.J. Son, J. Jeong, S.H. Park, **M.J. Ko***, and Y.-E. Sung*, “Highly Efficient Bifacial Dye-Sensitized Solar Cells Employing Polymeric Counter Electrodes”, *ACS Appl. Mater. Interfaces* **10**(10), 8611-8620 (2018).
141. J.W. Jo, M.-S. Seo, J.W. Jung, J.-S. Park, B.-H. Sohn, **M.J. Ko***, and H.J. Son*, “Development of organic-inorganic double hole-transporting material for high performance perovskite solar cells”, *Journal of Power Sources* **378**, 98-104 (2018).
140. D.W. Jeong, J.Y. Kim, H.W. Seo, K.M. Li, **M.J. Ko**, and T.Y. Seong, and B.S. Kim, “Characteristics of gradient-interface-structured ZnCdSSe quantum dots with modified interface and its application to quantum-dot-sensitized solar cells”, *Applied Surface Science* **429**, 116-22 (2018).
139. H. Cha, S. Bae, H. Jung, **M. J. Ko**, and H. Jeon, “Single-Mode Distributed Feedback Laser Operation in Solution-Processed Halide Perovskite Alloy System”, *Advanced Optical Materials* **5**, 1700545 (2017).

138. J.W. Jo, J.H. Hun, S. Bae, **M.J. Ko**, and H.J. Son, “Development of a conjugated donor-acceptor polyelectrolyte with high work function and conductivity for organic solar cells”, *Organic Electronics* **50**, 1-6 (2017).
137. I. Jeong, Y.H. Park, S. Bae, M. Park, H. Jeong, P. Lee*, and **M.J. Ko***, “Solution-Processed Ultrathin TiO₂ Compact Layer Hybridized with Mesoporous TiO₂ for High-Performance Perovskite Solar Cells”, *ACS Appl. Mater. Interfaces* **9**(42), 36865-36874 (2017)
136. J.H. Yun, H. Ahn, P. Lee, **M.J. Ko**, and H.J. Son, “Development of Highly Crystalline Donor–Acceptor-Type Random Polymers for High Performance Large-Area Organic Solar Cells”, *Macromolecules* **50**(19), 7567-7576 (2017)
135. Y.H. Park, I. Jeong, S. Bae, H.J. Son, P. Lee, J. Lee, C.-H. Lee*, and **M.J. Ko***, “Inorganic Rubidium Cation as an Enhancer for Photovoltaic Performance and Moisture Stability of HC(NH₂)₂PbI₃ Perovskite Solar Cells”, *Advanced Functional Materials* **27**(16), 1605988 (2017)
134. S. Kim, I. Jeong, J. Hwang, **M.J. Ko**, and J. Lee, “Simple synthesis of multiple length-scale structured Nb₂O₅ with functional macromolecule-integrated mesoporous frameworks”, *Chem. Commun.* **53** (29), 4100-4103 (2017)
133. K. Choi, Y. Yoon, J. Jung, C.W. Ahn, G.J. Lee Y.M. Song, **M.J. Ko**, H.S. Lee, B. Kim, and I.-S. Kang, “Super-Antireflective Structure Films with Precisely Controlled Refractive Index Profile”, *Advanced Optical Materials* **5**(3), 1600616 (2017)
132. J.-W. Ock, D. Kim, H. Kim, H. Jung, H.J. Son, **M.J. Ko**, J. Koh, and B. Kim, “Balancing intermolecular interactions by variation of pendent alkyl chains for high performance organic photovoltaics”, *Dyes and Pigments* **137**, 445-455 (2017)
131. J.W. Jo, J.W. Jung, H. Ahn, **M.J. Ko**, A. K.-Y. Jen, and H.J. Son, “Effect of Molecular Orientation of Donor Polymers on Charge Generation and Photovoltaic Properties in Bulk Heterojunction All-Polymer Solar Cells”, *Advanced Energy Materials* **7**(1), 1601365 (2017)
130. D.W. Jeong, J.Y. Park, T.-S. Kim, T.-Y. Seong, J.-Y. Kim, **M.J. Ko***, B.S. Kim*, “Fine Tuning of Colloidal CdSe Quantum Dot Photovoltaic Properties by Microfluidic Reactors”, *Electrochimica Acta* **222**, 1668-1676 (2016)
129. J.H. Yun, S. Park, J.H. Heo, H.-S. Lee, S. Yoon, J. Kang, S.H. Im, H. Kim, W. Lee, B. Kim, **M.J. Ko**, D.S. Chung, and H.J. Son, “Enhancement of charge transport properties of small molecule semiconductors by controlling fluorine substitution and effects on photovoltaic properties of organic solar cells and perovskite solar cells”, *Chem. Sci.*, **7**, 6649-6661 (2016).
128. I. Jeong, H. Jung, M. Park, J.S. Park, H.J. Son, J. Joo, J. Lee*, and **M.J. Ko***, “A Tailored TiO₂ Electron Selective Layer for High-Performance Flexible Perovskite Solar Cells via low temperature UV process”, *Nano Energy* **28**, 380-389 (2016).

127. H. Jeong, J.-Y. Kim, B. Koo, H.J. Son, D. Kim, and **M.J. Ko***, “Rapid sintering of MoS₂ counter electrode using near-infrared pulsed laser for use in highly efficient dye-sensitized solar cells”, *Journal of Power Sources* **330**, 104-110 (2016)..
126. J.-Y. Kim, J.Y. Lee, K.-Y. Shin, H. Jeong, H.J. Son, C.-H. Lee, J.H. Park, S.-S. Lee, J.G. Son*, and **M.J. Ko***, “Highly crumpled graphene nano-networks as electrocatalytic counter electrode in photovoltaics”, *Applied Catalysis B: Environmental* **192**, 342–349 (2016).
125. J.W. Jo, Y. Kim, **M.J. Ko** and H.J. Son, “Development of intrinsically fullerene-compatible polymers: Strategy for developing high performance organic solar cells using a nonhalogenated solvent”, *Dyes and Pigments*, **132**, 103-109 (2016).
124. M. Park, J.-Y. Kim, H.J. Son, C.-H. Lee, S.S. Jang, **M.J. Ko***, “Low-Temperature Solution-Processed Li-Doped SnO₂ as an Effective Electron Transporting Layer for High-Performance Flexible and Wearable Perovskite Solar Cells”, *Nano Energy*, **26**, 208-215 (2016).
123. B. Koo, H. Jung, M. Park, J.-Y. Kim, H.J. Son, and **M.J. Ko***, “Pyrite-Based Bi-functional Layer for Long-term Stability and High Performance of Organo-Lead Halide Perovskite Solar Cells” *Advanced Functional Materials*, **26**(30), 5400-5407 (2016) (**Inside Front Cover Paper**)
122. S. Park, J. H. Heo, J.H. Yun, T.S. Jung, K. Kwak, **M.J. Ko**, C.H. Cheon, J.Y. Kim, S.H. Im, and H.J. Son, “Effect of multi-armed triphenylamine-based hole transporting materials for high performance perovskite solar cells” *Chemical Science*, **7**(8), 5517–5522 (2016)
121. Y.J. Jang, I. Jeong, J. Lee, J. Lee, **M.J. Ko*** and J.S. Lee*, “Unbiased sunlight-driven artificial photosynthesis of carbon monoxide from CO₂ using ZnTe-based photocathode and perovskite solar cell in tandem.” *ACS Nano*, **10** (7), 6980-6987 (2016)
120. J. W. Jo, J.W. Jung, S. Bae, **M.J. Ko**, H. Kim, W.H. Jo, A.K.-Y. Jen, and H.J. Son, “Development of Self-Doped Conjugated Polyelectrolytes with Controlled Work Functions and Application to Hole Transport Layer Materials for High-Performance Organic Solar Cells”, *Advanced Materials Interfaces*, **3** (12), 1500703 (2016).
119. J. W. Jo, M.-S. Seo, M. Park, J.-Y. Kim, J.S. Park, I.K. Han, H. Ahn, B.-H. Son, **M.J. Ko***, and H.J. Son*, “Improving Performance and Stability of Flexible Planar-heterojunction Perovskite Solar Cells using Polymeric Hole-transport Material”, *Advanced Functional Materials*, **26** (25), 4464-4471 (2016). (**Inside Front Cover Paper**)
118. S.-M. Seo, I. Jeong, J.-S. Park, J. Lee, I.K. Han, W.I. Lee, H.J. Son, B.-H. Sohn*, and **M.J. Ko***, “Vertically aligned nanostructured TiO₂ photoelectrodes for high efficiency perovskite solar cells via block copolymer template approach” *Nanoscale*, **8** (22), 11472-11479 (2016)
117. Y. Li, S. Carretero-Palacios, K. Yoo, J.H. Kim, A.Solano, C.-H. Lee, H. Míguez*, and **M.J. Ko***, “Maximized performance of dye solar cells on plastic: a combined theoretical and experimental optimization approach”, *Energy & Environmental Science*, **9**(6), 2061-2071 (2016)

116. R.S. Kumar, H. Jeong, J. Jeong, R. K. Chitumalla, **M.J. Ko**, K.S. Kumar, J. Jang and Y.-A. Son, “Synthesis of porphyrin sensitizers with a thiazole group as an efficient p-spacer: potential application in dye-sensitized solar cells”, *RSC Advances*, **6**, 41294–41303 (2016).
115. S.W. Seo, J.-O. Jeon, J.W. Seo, Y.Y. Yu, J.-H. Jeong, D.-K. Lee, H. Kim, **M.J. Ko**, H.J. Son, H.W. Jang, and J.Y. Kim, “Compositional and Interfacial Modification of $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$ Thin-Film Solar Cells Prepared by Electrochemical Deposition”, *ChemSusChem*, **9**, 439 – 444 (2016).
114. I.J. Park, M.A. Park D.H. Kim, G.D. Park, B.J. Kim, H.J. Son, **M.J. Ko**, D.-K. Lee, T. Park, H. Shin, N.-G. Park, H.S. Jung, and J.Y. Kim, “New Hybrid Hole Extraction Layer of Perovskite Solar Cells with a Planar p-i-n Geometry”
J. Phys. Chem. C, **119** (49), 27285–27290 (2015).
113. J.-Y. Kim, J. Yang, J.H. Yu, W. Baek, C.-H. Lee, H.J. Son, T. Hyeon*, and **M.J. Ko***, “Highly Efficient Copper-Indium-Selenide Quantum Dot Solar Cells: Suppression of Carrier Recombination by Controlled ZnS Overlayers”,
ACS Nano, **9** (11), 11286-11295 (2015).
112. M. Park, H.-J. Kim, I. Jeong, J. Lee, H. Lee, H.J. Son, D.-E. Kim*, and **M.J. Ko***, “Mechanically Recoverable and Highly Efficient Perovskite Solar Cells: Investigation of Intrinsic Flexibility of Organic-Inorganic Perovskite”,
Advanced Energy Materials, **5**, 1501406 (2015). **(Selected as a Back Cover Paper)**.
111. J.H. Yoon, I. Lee, T.-S. Kim, **M.J. Ko**, J.Y. Kim and H.J. Son, “Synergistic enhancement and mechanism study of mechanical and moisture stability of perovskite solar cells introducing polyethylene-imine into the $\text{CH}_3\text{NH}_3\text{PbI}_3/\text{HTM}$ interface”,
J. Mater. Chem. A, **3**, 22176-22182 (2015).
110. I. Jeong, H.J. Kim, B.-S. Lee, H.J. Son, J.Y. Kim, D.-K. Lee, D.-E. Kim, J. Lee*, and **M.J. Ko***, “Highly efficient perovskite solar cells based on mechanically durable Molybdenum cathode”,
Nano Energy, **17**, 131–139 (2015). **(Selected as a Back Cover Paper)**.
109. Y. Li, K. Yoo, D.-K. Lee, J.Y. Kim, H.J. Son, J.H. Kim, C.-H. Lee, H. Míguez*, and **M.J. Ko***, “Synergistic Strategies for the Preparation of Highly Efficient Dye-Sensitized Solar Cells on Plastic substrates: Combination of Chemical and Physical Sintering”,
RSC Advances, **5**, 76795–76803 (2015).
108. J.-Y. Kim, J. Shin, D. Kim, Y.-E. Sung*, and **M.J. Ko***, “Long Vertically Aligned TiO_2 Nanotube Electrodes Prepared via Two-Step Anodization for Highly Efficient Photovoltaics”, *Israel Journal of Chemistry*, **55(9)**, 1034-1040 (2015).
107. I. Hwang, I. Jeong, J. Lee, **M.J. Ko**, and K. Yong, “Enhancing Stability of Perovskite Solar Cells to Moisture by the Facile Hydrophobic Passivation”,
ACS Appl. Mater. Interfaces, **7(31)**, 17330-17336 (2015).
106. Y. Kim, T.I. Ryu, K.-H. Ok, M.-G. Kwak, S. Park, N.-G. Park, C.J. Han, B.S. Kim, **M.J. Ko**, H.J. Son, and J.-W. Kim, “Inverted Layer-By-Layer Fabrication of an Ultraflexible and Transparent Ag Nanowire/Conductive Polymer Composite Electrode for Use in High-Performance Organic Solar Cells”
Advanced Functional Materials, **25**, 4580-4589 (2015).

105. S. Park, J. Cho, **M.J. Ko**, D.S. Chung, and H.J. Son, “Synthesis and Charge Transport Properties of Conjugated Polymers Incorporating Difluorothiophene as a Building Block”, *Macromolecules*, **48**, 3883-3889 (2015).
104. J.S. Kang, M.-A. Park, J.-Y. Kim, S.H. Park, D.Y. Chung, S.-H. Yu, J. Kim, J. Park, J.-W. Choi, K.J. Lee, J. Jeong, **M.J. Ko***, K.-S. Ahn*, Y.-E. Sung*, “Reactively sputtered nickel nitride as electrocatalytic counter electrode for dye- and quantum dot-sensitized solar cells”, *Sci. Rep.* **5**, 10450; DOI:10.1038/srep10450 (2015).
103. J.-Y. Kim, J.S. Kang, J. Shin, J. Kim, S.-J. Han, J. Park, Y.-S. Min, **M.J. Ko***, and Y.-E. Sung*, “Highly uniform and vertically aligned SnO₂ nanochannel arrays for photovoltaic applications”, *Nanoscale*, **7** (18), 8368-8377 (2015). (**Front Cover Paper**).
102. Y. H. Rhee, C.J. Lee, **M.J. Ko**, J.-H. Jin, and N.K. Min, “Enhancing the Efficiency of Electron Conduction in Spray-Coated Anode of Photoelectrochemical Cell Using Oxygenated Multi-Walled Carbon Nanotubes”, *J. Phys. Chem. C.*, **119**, 9085-9991 (2015).
101. K. Yoo, J.-Y. Kim, J.A. Lee, J.S. Kim, D.-K. Lee, K. Kim, J.Y. Kim, B. Kim, H. Kim, W.M. Kim, J.H. Kim, and **M.J. Ko***, “Completely Transparent Conducting Oxide-Free and Flexible Dye-Sensitized Solar Cells Fabricated on Plastic Substrates”, *ACS Nano*, **9** (4), 3760-3771 (2015).
100. M. Jung, D. Seo, K. Kwak, A. Kim, W. Cha, H. Kim, Y. Yoon, **M.J. Ko**, D.-K. Lee, J.Y. Kim, H.J. Son, and B. Kim, “Structural and morphological tuning of dithienobenzodithiophenecore small molecules for efficient solution processed organic solar cells”, *Dyes and Pigments*, **115**, 23-34 (2015).
99. J.Y. Choi, W. Kang, B. Kang, W. Cha, S.K. Son, Y. Yoon, H. Kim, Y. Kang, **M.J. Ko**, H.J. Son, K. Cho, J.H. Cho, and B. Kim, “High Performance of Low Band Gap Polymer-Based Ambipolar Transistor Using Single-Layer Graphene Electrodes”, *ACS Applied Materials & Interfaces*, **7**, 6002-6012 (2015).
98. M. M. Rahman, **M.J. Ko** and J.-J. Lee, “Novel energy relay dyes for high efficiency dye-sensitized solar cells”, *Nanoscale*, **7**, 3526-3531 (2015).
97. S.H. Kim, J. Choi, C. Sakong, J.W. Namgoong, W. Lee, D.H. Kim, B. Kim, **M.J. Ko**, and J.P. Kim, “The effect of the number, position, and shape of methoxy groups in triphenylamine donors on the performance of dye-sensitized solar cells”, *Dyes and Pigments*, **113**, 390-401 (2015).
96. S. Park, D. Seo, T.I. Ryu, G. Ahn, K. Kwak, H. Kim, C.H. Cheon, N.-G. Park, B. Kim, **M.J. Ko**, D.-K. Lee, J.Y. Kim, H. Kim, H.J. Son, “Enhancement of Organic Photovoltaic Efficiency via Nanomorphology Control using Conjugated Polymers Incorporating Fullerene Compatible Side-Chains”, *Macromolecules* **48**, 337–345 (2015).
95. J. Seok, K.Y. Ryu, J.A. Lee, I. Jeong, N.-S. Lee, J.M. Baik, J.G. Kim, **M.J. Ko**, K. Kim, and M.H. Kim, “Ruthenium based nanostructures driven by morphological controls as efficient counter electrodes for dye-sensitized solar cells”, *Phys.Chem.Chem.Phys.*, **17**, 3004-3008 (2015).

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C. List of Registered Patents (total 47 registered patents)

	Title	Registered Number	Registration Date	Registered Country
1	Organic solar cell and method for fabricating the same	10256423	2019.04.09	USA
2	Conductive organic semiconductor compound, method for preparing the same and organic thin-film transistor including the same	09941476	2018.04.10	USA
3	Polythiophene star copolymer capable of being self-doped by external stimulus, a method for producing the same, a conductive thin film using the same, and a method for producing the conductive thin film	09908979	2018.03.06	USA
4	Conjugated polymer for organic solar cells and Organic solar cells comprising the same	1017995620000	2017.11.14	Republic of Korea
5	Electron transporting layer for flexible perovskite solar cells and flexible perovskite solar cells including the same	1017739720000	2017.08.28	Republic of Korea

6	Low band gap polymer compound, synthesis of thereof, and organic photovoltaic cell containing the same	09735365	2017.08.15	USA
7	moisture barrier membrane for organic-inorganic hybrid perovskites photovoltaic cells comprising ionic polymer, photovoltaic cells comprising the same and manufacturing method thereof	1017238240000	2017.03.31	Republic of Korea
8	Hydrophobic Inorganic Charge Transport Nanoparticles Layer for Organo-inorganic Hybrid Materials Solar Cells	1016929850000	2016.12.29	Republic of Korea
9	Organic semiconductor compound, manufacturing method thereof and organic thin film transistor having them	1016619140000	2016.09.27	Republic of Korea
10	Sensitizing dye solution, working electrode prepared thereby, and dye-sensitized solar cell comprising the same	1016357580000	2016.06.28	Republic of Korea
11	organic-inorganic hybrid solar cells having organic semiconductor compound and manufacturing method thereof	1016075940000	2016.03.24	Republic of Korea
12	organic semiconductor compound and organic solar cell having them	1015959190000	2016.02.15	Republic of Korea
13	Conjugated polymer for organic solar cells and Organic solar cells comprising the same	1015508440000	2015.09.01	Republic of Korea
14	Method for manufacturing Cu ₂ ZnSnS _{4-x} Se _x (0≤x≤4) thin film by one step electrodeposition using ionic liquids	1015503490000	2015.08.31	Republic of Korea
15	Low band gap polymers, the organic photovoltaic cell comprising the same, and the synthesis thereof	1015142070000	2015.04.16	Republic of Korea
16	Counter electrode for dye-sensitized solar cell and preparation method thereof	09005457	2015.04.14	USA
17	Silole Derivatives and Organic Photovoltaic cell	1014904700000	2015.01.30	Republic of Korea
18	Electrodes for dye-sensitized solar cells, preparation method thereof, and solar cells using the same	1014370460000	2014.08.27	Republic of Korea
19	Electrodes for dye-sensitized solar cells, preparation method thereof, and solar cells using the same	1014370460000	2014.08.27	Republic of Korea
20	METHOD FOR PRODUCING SYNTHETIC GAS BY USING SOLID ACID	1014120150000	2014.06.19	Republic of Korea
21	MANUFACTURING METHOD OF SOLID-STATE DYE-SENSITIZED SOLAR CELLS	1014069690000	2014.06.05	Republic of Korea

	AND ELECTROLYTE FILLING DEVICE USED THEREFOR			
22	METHOD FOR PREPARING HYDROGEN GAS BY USING SOLIDACID MIXTURE	1014014180000	2014.05.23	Republic of Korea
23	Polymer gel electrolyte composition, the preparing method for the composition, and dye-sensitized solar cell comprising the electrolyte	1013818730000	2014.03.31	Republic of Korea
24	Triphenylamine derivatives and organic photovoltaic cell comprising the derivatives	1013740700000	2014.03.07	Republic of Korea
25	Device for coating CIS based film	1013706370000	2014.02.27	Republic of Korea
26	Doping-free silicon solar cell and the Fabrication method thereof	1013697290000	2014.02.26	Republic of Korea
27	Dye-adsorption method for dye- sensitized solar cells, working electrode and dye-sensitized solar cells using the same	1013697310000	2014.02.26	Republic of Korea
28	POLYTHIOPHENE STAR COPOLYMER SELF-DOPED BY EXTERNAL STIMULI, PROCESS FOR PREPARATION OF THE SAME, CONDUCTIVE THIN FILM USING THE SAME AND METHOD FOR PREPARATION OF THE CONDUCTIVE THIN FILM	1013651380000	2014.02.11	Republic of Korea
29	Method for preparing CIS based film, the CIS based film prepared therefrom, and film solar cell including the CIS based film	1013275360000	2013.11.04	Republic of Korea
30	Fabrication method for CIS-based compound thin film having improved packing density	1013275380000	2013.11.04	Republic of Korea
31	Triphenylamine derivatives and organic photovoltaic cells including the derivatives	08568623	2013.10.29	USA
32	Methanofullerene derivatives and the organic solar cell device comprising the derivatives	1012955260000	2013.08.06	Republic of Korea
34	Flexible electrodes and preparation method thereof, and flexible dye- sensitized solar cells using the same	1012795860000	2013.06.21	Republic of Korea
35	A counter electrodes for dye- sensitized solar cells and preparation method thereof	1012735670000	2013.06.04	Republic of Korea
36	Low band gap polymers, the synthesis of the polymers, and the organic photovoltaic cell comprising the polymers	1012655110000	2013.05.13	Republic of Korea
37	A polymer for organic solar-cell and preparation method thereof	1011843420000	2012.09.13	Republic of Korea
38	SOLAR TREE AND ARTIFICIAL STRUCTURE COMPRISING THE SAME	1011665190000	2012.07.11	Republic of Korea

39	PREPARATION METHOD OF DYE-SENSITIZED SOLAR CELL MODULE INCLUDING SCATTERING LAYERS	1011407840000	2012.04.20	Republic of Korea
40	COMPOSITION FOR PHOTO-ELECTRODES, PHOTO-ELECTRODES AND DEY-SENSITIZED SOLAR CELLS COMPRISING THE SAME	1011403610000	2012.04.19	Republic of Korea
41	MULTI-LAYERED DYES-SENSITIZED SOLAR CELLS AND METHOD FOR PREPARING THE SAME	1011399230000	2012.04.18	Republic of Korea
42	TANDEM SOLAR CELL USING AMORPHOUS SILICON SOLAR CELL AND ORGANIC SOLAR CELL	1011171270000	2012.02.09	Republic of Korea
43	Tandem Cells Using Highly Dispersive Nano Metal Oxide Interlayer and Fabrication Methods thereof	1010837980000	2011.11.09	Republic of Korea
44	MANUFACTURING METHODE OF COUNTER ELECTRODE IN DYE-SENSITIZED SOLAR CELLS	1010788730000	2011.10.26	Republic of Korea
45	PHOTO ELECTRODES COMPRISING CONDUCTIVE NON-METAL FILM, AND DYE-SENSITIZED PHOTOVOLTAIC CELL COMPRISING THE SAME	1010619700000	2011.08.29	Republic of Korea
46	ELECTRODES COMPRISING METAL OXIDE-POLYMER COMPOSITE AND PREPARATION METHOD THEREOF, AND DYE-SENSITIZED SOLAR CELLS USING THE SAME	1010346400000	2011.05.04	Republic of Korea
47	ELECTRODES COMPRISING ELECTROSPUN POLYMER NANOFIBERS-SPRAYED METAL OXIDE NANOCOMPOSITE AND PREPARATION METHOD THEREOF, AND DYE-SENSITIZED SOLAR CELLS USING THE SAME	1010327910000	2011.04.26	Republic of Korea