CURRICULUM VITAE

Tae Wook (Elliot) Kim
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SUMMARY

20+ years in R&D including petroleum, chemical, carbon capture technology, and hydrology
5+ years in consulting for carbon capture and storage (CCS) projects
Inclusive leadership skills to motivate teams and mentor engineers
Excellent skills in analytical instruments and scientific software to support scientific findings
Stellar communication and presentation skills

FIELDS OF EXPERTISE:

Geological carbon sequestration; Carbon capture & separation process; Enhanced oil recovery (EOR) capture methods for unconventional reservoirs; Characterization of reservoirs core; Geospatial data analysis with GIS S/W; Oil Shale maturation under field conditions; Hydraulic fracturing on shale formation; Geotechnical properties of shale; Transport phenomena in porous media

EMPLOYMENT HISTORY & MISSION:

Stanford University, Department of Energy Resources Engineering
Senior Physical Science Research Scientist, November 2019 – Present
Physical Science Research Scientist, August 2016 – October 2019
Physical Science Research Associate, August 2012 – July 2016

- Led 4 carbon capture, utilization, and storage (CCUS) projects in partnership with the Department of Energy and industry stakeholders including Cairn India, Shell, and Sentinel Peak Resources (SPR)
- Developed an action plan for carbon capture and storage with a consulting firm, Energy Future Initiative (EFI)
- Conducted techno-economic analysis, optimizing network costs and tax credits, to determine the feasibility of carbon capture and storage (CCS)
- Analyzed capturable emissions with associated costs, geological formation storage capacity, risk factors to identify optimal carbon storage sites and emitters
- Directed enhanced oil recovery and shale oil projects under field conditions to develop the usage of carbon as a fracturing fluid
- Published 12 papers in journals including *the International Journal of Greenhouse Gas Control (IGGC), Society of Petroleum Engineers (SPE) Journal*, Water Resources Research, etc.
- Mentored 10+ graduate students and postdoctoral fellows on carbon capture and utilization projects

San Jose State University, Department of Biomedical, Chemical, and Materials Engineering, Part-time Lecturer, January 2016 – May 2016

- Taught a graduate level course, *Advanced Mass Transfer*, to 20+ students

Lawrence Berkeley National Laboratory, Earth Science Division, Hydrogeology Department Postdoctoral Fellow, October 2010 – July 2012

- Investigated and assess the effect of geological formation during carbon storage process
- Collaborated with a multi-disciplinary team of 3 researchers to understand carbon storage in geological formations

Stanford University, Department of Energy Resources Engineering
Postdoctoral Scholar, May 2009 – September 2010

- Conducted enhanced oil recovery project to provide optimal operating conditions for heavy oil production
- Mentored 2 Ph. D students on EOR projects to perform core flooding experiments

University of Southern California, Department of Chemical Engineering & Material Sciences
Visiting scholar (research associate), October 2008 – April 2009
Research Assistant, January 2004 – September 2008

- Synthesized and tested carbon separation membrane to find a novel synthesis method
- Researched a conductive membrane for methanol fuel cells with a novel synthesis method

- Analyzed data and publish journal papers or reports to present the research's findings

Samchully City Gas Company, South Korea
Senior Researcher and Assistant Manager, March 1996 - July 2003
- Led the development and application of safety technology in gas distribution pipeline system
- Taught and mentored 30+ junior engineers on natural gas pipeline risk assessment
- Oversaw the management of a $1 million team budget for the development of an integrated risk management system for underground gas pipeline

EDUCATION:

University of Southern California, Los Angeles, California
Ph.D., Chemical Engineering, December 2008
Thesis Title: *Studies of Transport Phenomena in Hydrotalcite Membranes, and Their Use in Direct Methanol Fuel Cells*
Advisors: Professors Theodore T. Tsotsis and Muhammad Sahimi

Inha University, Incheon, South Korea
M.S., Chemical Engineering, February 1996
B.S., Chemical Engineering, February 1994

HONOR & AWARD:

- William H. Brigham Memorial Award. June 2020

SKILLS:

- Scientific S/W: Reservoir simulator (CMG), Tecplot360, MATLAB, Paraview, COMSOL Multiphysics, Image J
- GIS S/W: ArcGIS Pro
- Office S/W: Microsoft Office
- Operation of Analytical Instruments:
  - X-ray Computed Tomography (CT) scanner
  - X-Ray Diffractometer (XRD), Scanning Electron Microscope (SEM), Roughness Profilometer
  - Synchrotron X-ray beamline (APS 13-BMD and SLAC 2-2/11-2)
  - Gas Chromatography (GC), Mass Spectrometer (MS), ICP-MS/OES, FT-IR
  - ThermoGravimetric Analyzer (TGA), Dynamic Light Scattering (DLS)
  - Helium Pycnometer, Surface Area & Pore size Analyzer (Micrometrics ASAP 2010)
  - Potentiostat/AC impedance spectroscopy

ACCOMPLISHED AND INVOLVED PROJECTS:

Stanford University (2009 – 2010, 2012 – Present)

1. Carbon Utilization and Storage Partnership (CUSP) for the Western USA, DOE project (2020 – present)
2. Carbon Capture and Storage Projects in California (collaboration with Energy Future Initiative (EFI) (2020)
3. Nanoparticles (NP) delivery via oil-water emulsion on porous media (2019 - present)
4. Technical Evaluation of CO_2 EOR Feasibility in Ravva Field, India (2019 – 2020)
5. Investigation of Breakdown pressure on shale with supercritical CO_2 and water on hydrofracturing (2018 – present)
6. Measurement of Geotechnical properties of oil shale (2017 – 2019)
7. Thermal maturation process of source rock (oil shale) under CT-scanner based triaxial condition at high pressure/high temperature condition (2016 - 2019)
8. High-temperature imbibition for enhanced oil recovery from Diatomite (2016 - 2018)
9. Viscous and heavy-oil solution gas drive in Alaska oil reservoirs (2012 - 2016)
10. Characteristic length and spontaneous imbibition study on sandstones and limestones (2012 - 2014)
11. Thermal and heavy oil recovery research as applied to offshore *fracture oil fields* (2009 - 2010)

Lawrence Berkeley National Laboratory (2010 - 2012)

12. Study of hydraulic properties of brine films on rock in geological CO_2 sequestration process (DOE-supported project (EFRC-NCGC), 2010 – 2013)

University of Southern California (2003 - 2009)

13. Development of novel cation-exchange membrane for direct methanol fuel cell (2005 - 2008)

14. Synthesis of Silicon Carbide Nanofibers by a Template Technique (2007 - 2008)
15. Study of reactive separations under microgravity conditions (NASA project, 2003 - 2007)
16. Layered materials as high-temperature membranes in CO_2 & H_2 production (DOE project, 2005 - 2006)

Samchully City Gas Company (1996 – 2003)

17. Comparison of heat shrinkable tube for pipeline coating systems (2003)
18. The study of GTL process from natural gas (2002)
19. Development of magnetic-added polyethylene pipe (2001)
20. Development of integrated risk management system for underground gas pipeline (1998 - 2001)
21. Analysis of gas pipeline corrosion characteristics (1996 - 1997)

Technical Reports:

EFI and Stanford University, **2020**. An Action Plant for Carbon Capture and Storage in California; Opportunities, Challenges, and Solution. Energy Futures Initiative and Stanford University Stanford Center for Carbon Storage.

PEER-REVIEWED PAPER PUBLICATIONS (only from 2012):

(All publication and citation information: https://scholar.google.com/citations?hl=en&user=ZZO1ik4AAAAJ&view_op=list_works&sortby=pubdate)

1. **Tae Wook Kim**, Catherine Callas, Sarah D. Saltzer, and Anthony Kovscek "**Assessment of oil and gas fields in California as potential CO_2 storage sites**", International Journal of Greenhouse Gas Control, **2022**, 114, 103579.
2. Ayaka Abe, **Tae Wook Kim**, and Roland N. Horne "**Laboratory Hydraulic Stimulation Experiments to Investigate the Interaction between Newly Formed and Preexisting Fractures**", International Journal of Rock Mechanics and Mining Science, **2021**, 104665.
3. Tala Al Shafloot, **Tae Wook Kim**, and Anthony Kovscek "**Investigating Fracture Propagation Characteristics in Shale Using sc-CO2 and Water with the Aid of X-ray Computed Tomography**", Journal of Natural Gas Science and Engineering, Dec **2020**, 103736.
4. **Tae Wook Kim**, Wonjin Yun, and Anthony Kovscek "A**pplication of Digital Volume Correlation to X-ray Computed Tomography Image of Shale**", Energy & Fuels, **2020**, 34, 11, 13636 – 13649.
5. **Tae Wook Kim**, Cynthia Ross, Kelly Guan, Alan Burnham, and Anthony Kovscek "Investigation of Source Rock's Properties under Triaxial Conditions during Pyrolysis (Thermal Maturation)", *SPE Journal*, June **2020** (DOI: http://dx.doi.org/10.2118/195366-PA).
6. **Tae Wook Kim**, E. Vittoratos, and A. R. Kovscek. "***Recovery Efficiency of 28º API Crude Oil System as a Function of Voidage Replacement Ratio***." *Journal of Petro Sci. & Eng.*, **2019** 175, 1063 (DOI:http://dx.doi.org/10.1016/j.petrol.2019.01.028).
7. **Tae Wook Kim** and A. R. Kovscek. "***The Effect of Voidage-Displacement Ratio on Critical Gas Saturation***." *SPE Journal*, September **2018** (DOI: http://dx.doi.org/10.2118/191383-PA).
8. **Tae Wook Kim**, E. Vittoratos, and A. R. Kovscek. "***An Experimental Investigation of Viscous Oil Recovery Efficiency as a Function of Voidage Replacement Ratio***." *SPE Journal*, February **2016** (DOI: http://dx.doi.org/10.2118/174032-PA).
9. Dunnmon, J., Sobhani, S., **Kim, T.W**. et al. "**Characterization of scalar mixing in dense gaseous jets using X-ray computed tomography."** Exp Fluids, **2015** 56, 193 (doi:10.1007/s00348-015-2057-9).
10. **Tae Wook Kim**, Tetsu Tokunaga, John Barger, Matthew Latimer, and Samuel Webb, "***Brine Film Thickness on Mica Surfaces Under Geological CO_2 Sequestration Conditions and Controlled Capillary Pressures***", Water Resources Research, **2013** *49, pp. 5071-5076,* DOI: 10.1002/wrcr.20404.
11. Tetsu Tokunaga, Jongwon Jung, **Tae Wook Kim,** and Jiamin Wan, Yongman Kim, Wenming Dong, "***Capillary Pressure and Saturation Relations for Supercritical CO2 and Brine in Sand:High-Pressure Pc(Sw) Controller/Meter Measurements and Capillary Scaling Predictions***.", Water Resources Research, **2013** 49, pp.4566-4579, doi:10.1002/wrcr.20316.
12. **Tae Wook Kim** and Antony Kovscek, "***Wettability Alteration of Heavy Oil/Brine/Carbonated System with temperature***." *Energy & Fuels,* **2013** *27,* pp.2984-2998*,* **DOI:** 10.1021/ef400204k.
13. **Tae Wook Kim**, Tetsu Tokunaga, Derek Shuma, Stephen Sutton, Matt Newville, and Antonio Lanzirotti, "***Thickness Measurements of Nanoscale Brine Films on Silica Surfaces Under Geological CO_2 Sequestration Conditions using synchrotron X-ray Fluorescence***.", *Water Resources Research,* **2012** 48, W09558.

CONFERENCE PRUBLICATION (only from 2015):

- **October, 2022:** Esuru Rita Okoroafor, **Tae Wook Kim**, Negar Nazari, Hannah Yuh Watkins, Sarah D. Saltzer, Anthony. R. Kovscek. "Assessing the Underground Hydrogen Storage Potential of Depleted Gas Fields in Northern California" SPE-209987-MS, SPE Annual Technical Conference and Exhibition, Houston, TX, USA.
- **May, 2022: Tae Wook Kim**, Sean Yaw, A. R. Kovscek. "Evaluation of Geological Carbon Storage Opportunities in California and a Deep Look in the Vicinity of Kern County" SPE-209340-MS, SPE Western Regional Meeting, Bakersfield, CA, USA.
- **December, 2021:** Tala Al Shafloot, **Tae Wook Kim**, Arjun Kohli, Anthony Kovscek "Investigating Transport and Structural Changes of Faults Slipping under $scCO_2$ Conditions", AGU Fall meeting, San Francisco, CA.
- **December, 2021:** Joshua Citron, **Tae Wook Kim**, Anthony Kovscek "Design of Novel Porous Media for the Study of Nonequilibrium Chemical Processes", AGU Fall meeting, San Francisco, CA.
- **December, 2019: Tae Wook Kim**, W. Yun, A. R. Kovscek. "Application of Digital Volume Correlation and X-ray Computed Tomography Reveal Shale Geomechanical Properties at Elevated Temperature", AGU Fall Meeting, San Francisco, CA, USA.
- **December, 2019:** T. Shafloot, **Tae Wook Kim**, A. R. Kovscek. "Breakdown Pressure of Green River Shale With sc-CO_2 and Water Monitored Using X-ray Computed Tomography", AGU Fall Meeting, San Francisco, CA, USA.
- **May, 2019: Tae Wook Kim**, C. M. Ross, K. Guan, A. K. Burnham, A. R. Kovscek. "Permeability and Porosity Evolution of Organic Rich Sales as a Result of Heating" SPE-195366-MS, SPE Western Regional Meeting, San Jose, CA, USA.
- **May, 2017: Tae Wook Kim** and A. R. Kovscek. " High Temperature Imbibition for Enhanced Recovery from Diatomite " SPE-185632-MS, SPE Western Regional Meeting, Bakersfield, CA, USA.
- **May, 2015: Tae Wook Kim**, E. Vittoratos, and A. R. Kovscek. "An Experimental Investigation of Viscous Oil Recovery Efficiency as a Function of Voidage Replacement Ratio." SPE Western Regional Meeting, Garden Grove, CA, USA.

REVIEWED JOURNALS LISTS AS A REVIEWER:

Journal of Petroleum Science & Engineering, Energy and Fuels, RSC Advances, Journal of Materials Chemistry A, Chemical Communications, Journal of Nanomaterials

PATENTS:

"Method of making a plastic pipe used by a magnetic substance." Inventors, **Tae Wook Kim**, Yur-hwal Yun, Hae-joong Kim; Patent Registration No. 10-0441669-0000, Ministry of Patents, South Korea; **2003**

SOCIAL ACTIVITIES:

- Mentor and director for Young Adult Group in Maranatha Vision Church (2010 – 2020)
- Society of Petroleum Engineers (SPE, 2010- 2011, 2013-present), American Geophysical Union (AGU, 2010-present), and American Institute of Chemical Engineers (AICHE, 2007 – 2009) member