

S. KENT HOEKMAN

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Education

Ph.D. 1980	Iowa State University, Ames, IA	Organic Chemistry
B.S. 1975	Calvin College, Grand Rapids, MI	Chemistry

Professional Interests and Activities

Dr. Hoekman is a Research Professor, Emeritus within the Division of Atmospheric Sciences at the Desert Research Institute (DRI). DRI is a statewide division of the Nevada System of Higher Education (NSHE) that pursues basic and applied environmental research on local, national, and international scales. His professional interests include environmental impacts of energy production, distribution, and use; development of renewable and sustainable energy systems; conversion of biomass to biofuels; air quality impacts of vehicle emissions; and impacts of advanced-technology fuels and vehicles on emissions and energy use. He is also interested in the interface between politics and environmental science, particularly in the areas of energy policy, renewable fuels, greenhouse gases, and climate change.

In addition to his personal professional activities, Dr. Hoekman has provided leadership for DRI in the identification, protection, and licensing of intellectual property (IP) developed at the Institute. Dr. Hoekman was instrumental in establishing a joint Technology Transfer Office (TTO) between DRI and the University of Nevada, Reno (UNR), and has served as DRI's Liaison to the TTO, where he oversaw the activities of this office on behalf of DRI.

Dr. Hoekman has also served DRI by coordinating and promoting the Institution's R&D portfolio in the field of renewable energy. He has led the effort to establish a Renewable Energy Center (REC) at DRI, and continues to provide leadership in this area by serving as Director of DRI's Clean Technologies and Renewable Energy Center (CTREC). For further information about this renewable energy work, please refer to the CTREC website at <http://www.dri.edu/ctrec>.

In addition, Dr. Hoekman is active in the scientific academic and business communities. He serves as a reviewer for numerous science and engineering journals, is a member of several professional societies, has assisted in organizing scientific conferences, and contributes to the mentoring and advisement of graduate students at the University of Nevada in Reno (UNR). Currently, he serves as Associate Editor for the *International Journal of Alternative Energy* and the journal *Energies*.

From 2001 to 2007, Dr. Hoekman served as Executive Director of DRI's Division of Atmospheric Sciences (DAS). DAS consists of approximately 50 research faculty, along with 70 technologists, graduate students, post-docs, and other support staff. The Division conducts fundamental and applied research around the world on topics pertaining to emissions, renewable energy, air pollution, meteorology, climatology, aerosol chemistry and physics, and other areas related to atmospheric science. DAS also serves as the institutional home for the Western Regional Climate Center, one of six NOAA-funded regional climate centers in the U.S. As Director, Dr. Hoekman was responsible for all personnel, financial, organizational, and professional activities of Divisional operations. The Division's scientific work is sponsored by over 100 federal, state, local, and private organizations that provide approximately \$14 million per year in research grants and contracts. For

more information about the Division and its activities, please refer to its web site at <http://www.das.dri.edu>.

Prior to joining DRI in 2001, Dr. Hoekman spent over 20 years at Chevron, where his research focused on transportation fuels and their impacts on motor vehicle emissions and air quality. Experimental work included detailed characterization of exhaust emissions compositions from gasoline-, diesel-, and alcohol-fueled vehicles. Laboratory studies were conducted to investigate how changes in fuel formulation could reduce vehicle emissions and improve ambient air quality. He has served on several technical committees representing the American Petroleum Institute (API), the Western States Petroleum Association (WSPA), the Coordinating Research Council (CRC), and other industry organizations interested in fuels, emissions, atmospheric chemistry and air quality.

Dr. Hoekman also has experience in environmental regulatory affairs pertaining to vehicles, fuels, emissions, air quality, and health effects. He has served in technical advisory roles to EPA and was a member of the California Air Resources Board (CARB) Research Screening Committee for five years. He served as a member of the Health Effects Institute's (HEI) Special Committee on Emerging Technologies from 2001 through 2007.

Professional Experience

2016 – Present	Research Professor, Emeritus, Division of Atmospheric Sciences, Desert Research Institute, Reno, NV
2007 – 2016	Research Professor, Division of Atmospheric Sciences, Desert Research Institute, Reno, NV
2001 – 2007	Executive Director, Division of Atmospheric Sciences, Desert Research Institute, Reno and Las Vegas, NV
1997 – 2001	Senior Staff Scientist, Chevron Products Co., San Francisco and San Ramon, CA
1990 – 1996	Staff Scientist and Senior Staff Scientist, Chevron Research and Technology Company, Richmond, CA
1980 – 1989	Research Chemist and Senior Research Chemist, Chevron Research and Technology Company, Richmond, CA

Professional Memberships

- American Association for the Advancement of Science (AAAS)
- American Chemical Society (ACS)
- Air and Waste Management Association (AWMA)
- Society of Automotive Engineers (SAE)
- American Institute of Chemical Engineers (AIChE)

Awards/Honors

- Chevron Chairman's Award (1984) – Presented in recognition of diesel emissions research
- Horning Memorial Award (1985) – Presented by the Society of Automotive Engineers
- Arch T. Colwell Merit Award (1985) – Presented by the Society of Automotive Engineers
- Society of Automotive Engineer's Award for Excellence in Oral Presentation (1993 and 1995)
- Recognition of Appreciation from the California Air Resources Board (2001)

Peer-Reviewed Publications

- Hoekman, S.K. and Broch, A. (2017). Environmental implications of higher ethanol production and use in the U.S.: A literature review. Part II – Biodiversity, land use change, GHG emissions, and sustainability. *Renew. Sustain. Energy Rev.* DOI: 10.1016/j.rser.2017.05.052.
- Hoekman, S.K., Broch, A., and Liu, X. (2017). Environmental implications of higher ethanol production and use in the U.S.: A literature review. Part I – Impacts on water, soil, and air quality. *Renew. Sustain. Energy Rev.* DOI: 10.1016/j.rser.2017.05.050.
- Liu, X., Hoekman, S.K., and Broch, A. (2017). Potential water requirements of increased ethanol fuel in the USA. *Energy, Sustain. Environ.* DOI: 10.1186/s13705-017-0121-4.
- Collet, S., Hoekman, S.K., Collins, J., Wallington, T.J., McConnell, S., and Gong, L. (2017). 2017 Mobile Source Air Toxics Workshop. *EM* May 2017,
- Liu, X., Hoekman, S.K., Farthing, W., and Felix, L. (2017). TC2015: Life Cycle Analysis of Co-Formed Coal Fines and Hydrochar Produced in Twin-Screw Extruder (TSE). *Envir. Prog. Sustain. Energy* **36** (3) 668-676. Doi 10.1002/ep.12552.
- Hoekman, S.K., Broch, A., Felix, L., and Farthing, W. (2017). Hydrothermal carbonization (HTC) of loblolly pine using a continuous, reactive twin-screw extruder. *Energy Conv. Management* **143**, 247-259. Doi: 10.1016/j.enconman.2016.12.035.
- Hoekman, S.K. (2016). Comment on “Damages and expected deaths due to excess NO_x emissions from 2009 to 2015 Volkswagen diesel vehicles.” *Environ. Sci. Technol.* **50**, 4135-4136. Doi: 10.1021/acs.est.6b00856.
- Liu, Z., Zhang, F., Hoekman, S.K., Liu, T., Gai, C. and Peng, N. (2016). Homogeneously Dispersed Zerovalent Iron Nanoparticles Supported on Hydrochar-Derived Porous Carbon: Simple, *in situ* Synthesis and Use for Dechlorination of PCBs. *ACS Sustainable Chem. Eng.* **4**, 3261-3267. Doi: 10.1021/acssuschemeng.6b00306.
- Hoekman, S.K. and Broch, A. (2016). MMT Effects on Gasoline Vehicles: A Literature Review. *SAE Int. J. Fuels Lubr.* **9** (1) 322-343. Doi: 10.4271/2016-01-9073.
- Liu, Z., Guo, Y., Balasubramanian, R., and Hoekman, S.K. (2016). Mechanical stability and combustion characteristics of hydrochar/lignite blend pellets. *Fuel* **164**, 59-65. Doi: 10.1016/j.fuel.2015.10.004.
- Jena, U., McCurdy, A.T., Warren, A., Summers, H., Ledbetter, R.N., Hoekman, S.K., Seefeldt, L.C., and Quinn, J.C. (2015). Oleaginous yeast platform for producing biofuels via co-solvent hydrothermal liquefaction. *Biotech. Biofuels* **8**, 167. Doi: 10.1186/s13068-015-0345-5.
- Summers, H.M., Ledbetter, R.N., McCurdy, A.T., Morgan, M., Seefeldt, L.C., Jena, U., Hoekman, S.K., and Quinn, J.C. (2015). Techno-economic feasibility and life cycle assessment of dairy effluent to renewable diesel via hydrothermal liquefaction. *Bioresour. Technol.* **196**, 431-440. Doi: 10.1016/j.biortech.2015.07.077.
- Schuetzle, D., Schuetzle, R., Hoekman, S.K., and Zielinska, B. (2015). The effect of oxygen on formation of syngas contaminants during the thermochemical conversion of biomass. *Int'l J. of Energy and Environ. Engin.* **6** (4) 405-417. Doi: 10.1007/s40095-015-0187-8.

- Collet, S., Hoekman, S.K., McCauley, E., and Wallington, T.J. (2015). Highlights from the Coordinating Research Council 2015 Mobile Source Air Toxics Workshop. *EM* July 2015, 28-32.
- Liu, X., Hoekman, S.K., Robbins, C., and Ross, P. (2015). Lifecycle climate impacts and economic performance of commercial-scale solar PV systems: A study of PV systems at Nevada's Desert Research Institute (DRI). *Solar Energy* **119**, 561-572. Doi: 10.1016/j.solener.2015.05.001.
- Chen, L.-W.A., Robles, J.A., Chow, J.C., and Hoekman, S.K. (2015). Renewable hydrogen production from bio-oil in an aerosol pyrolysis system. *Procedia Engineering* **102**, 1867-1876. Doi:10.1016/j.proeng.2015.01.325.
- Liu, Z., Hoekman, S.K., Balasubramanian, R., and Zhang, F.S. (2015). Improvement of fuel qualities of solid fuel biochars by washing treatment. *Fuel Proc. Technol.* **134**, 130-135. Doi:10.1016/j.fuproc.2015.025.
- Hoekman, S.K., Broch, A., Warren, A., Felix, L., and Irvin, J. (2014). Laboratory pelletization of hydrochar from woody biomass. *Biofuels* **5** (6) 651-666.
- Yan, W., Hoekman, S.K., Broch, A., and Coronella, C.J. (2014). Effect of hydrothermal carbonization reaction parameters on the properties of hydrochar and pellets. *Environ. Prog. Sustain. Energy* **33**, 676-680. Doi: 10.1002/ep.11974.
- Robbins, C., Goldade, T., Hoekman, S.K., Jacobson, R., and Turner, R. (2014). Empirically Driven Computer Simulations of Solar Thermal Systems for Space Heating and Domestic Hot Water. *ASME Technical Paper* ESHFuels2014-6476.
- Damm, C., Strobach, E., Robbins, C., Broch, A., Turner, R., and Hoekman, S.K. (2014). Development of the Renewable Energy Deployment and Display (REDD) Facility at the Desert Research Institute. *ASME Technical Paper* ESHFuels2014-6626.
- Reza, M.T., Uddin, M.H., Lynam, J.G., Hoekman, S.K., and Coronella, C.J. (2014). Hydrothermal carbonization of loblolly pine; reaction chemistry and water balance. *Biomass Conversion and Biorefinery* **4**, 311-321. Doi: 10.1007/s13399-014-0115-9.
- Broch, A., Jena, U., Hoekman, S.K., and Langford, J. (2014). Analysis of solid and aqueous phase products from hydrothermal carbonization of whole and lipid-extracted algae. *Energies* **2014**, **7**, 62-79. doi: 10.3390/en7010062.
- Yan, W., and Hoekman, S.K. (2014). Production of CO₂-free hydrogen from methane dissociation: a review. *Environ. Prog. Sustainable Energy*. **33** (1), 213-219. doi:10.1002/ep.11746.
- Hoekman S.K., A. Broch, C. Robbins, R. Purcell, B. Zielinska, L. Felix, and J. Irvin (2014). Process development unit (PDU) for hydrothermal carbonization of lignocellulosic biomass. *Waste Biomass Valorization*, **5**, 669-678. doi: 10.1007/s12649-013-9277-0.
- Liu, Z., Quek, A., Parshetti, G., Jain, A., Srinivasan, M.P., Hoekman, S.K., and Balasubramanian, R. (2013). A study of nitrogen conversion and polycyclic aromatic hydrocarbon (PAH) emissions during hydrochar-lignite co-pyrolysis. *Applied Energy* **108**, 74-81. Doi: 10.1016/j.apenergy.2013.03.012.
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- Liu, Z., A. Quek, S.K. Hoekman, and R. Balasubramanian (2013). Production of solid biochar fuel from waste biomass by hydrothermal carbonization. *Fuel* **103**, 943-949. Doi:10.1016/j.fuel.2012.07.069.
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- Hoekman, S.K. and C. Robbins (2012). Review of the effects of biodiesel on NO_x emissions, *Fuel Proc. Technol.* **96**, 237-249. doi:10.1016/j.fuproc.2011.12.036.
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- Robbins, C., S.K. Hoekman, E. Cenicerros, and M. Natarajan (2011). Effects of Biodiesel Fuels upon Criteria Emissions. *Soc. Auto. Eng. Tech. Paper* No. 2011-01-1943.
- Hoekman, S.K., A. Broch, and C. Robbins (2011). Hydrothermal Carbonization (HTC) of Lignocellulosic Biomass. *Energy Fuels* **25** (4) 1802-1810. Doi.org/10.1021/ef101745n.
- Bruins, R., S.K. Hoekman, R. Efroymsen, A. Aden, and A. Hecht (2010). Transportation Fuels for the 21st Century. *EM* Nov. 2010, 26-32.
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- Broch, A., S.K. Hoekman, A. Gertler, C. Robbins, and M. Natarajan (2009). Biodistillate Transportation Fuels 3 – Life-Cycle Impacts. *Soc. Auto. Eng. Tech. Paper* No. 2009-01-2768.
- Hoekman, S.K. (2009). Biofuels in the U.S. – Challenges and Opportunities. *Renewable Energy* **34**, 14-22.
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- Hoekman, S.K., R.M. Stanley, W.L. Clark, W.O. Siegl, A.M. Schlenker and W.F. Biller (1995). CRC Speciated Hydrocarbon Emissions Analysis Round Robin Test Program. *Soc. Auto. Eng. Tech. Paper* No. 950780.
- Hoekman, S.K. and T.E. Jensen (1993). Methanol Vehicle Emissions Round Robin Test Program. *Soc. Auto. Eng. Tech. Paper* No. 932773.
- Hoekman, S.K. (1993). Improved Gas Chromatography Procedure for Speciated Hydrocarbon Measurements of Vehicle Emissions. *J. Chromatog.*, **639**, 239-253.
- Hoekman, S.K. (1992). Speciated Measurements and Calculated Reactivities of Vehicle Exhaust Emissions from Conventional and Reformulated Gasolines. *Environ. Sci. Technol.* **26**, 1206-1216.
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- Gething, J.A., S.K. Hoekman, A.R. Guerrero and J.M. Lyons (1990). The Effect of Gasoline Aromatics Content on Exhaust Emissions: A Cooperative Test Program. *Soc. Auto. Eng. Tech. Paper* No. 902073.
- Eberhard, G.A., M. Ansari and S.K. Hoekman (1990). Emissions and Fuel Economy Tests of a Methanol Bus with a 1988 DDC Engine. *Soc. Auto. Eng. Tech. Paper* No. 900342.
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- Horn, J.C. and S. K. Hoekman (1989). Methanol-Fueled Light-Duty Vehicle Exhaust Emissions. *Air and Waste Management Association Paper* No. 89-9.3.
- Hoekman, S.K. and M.C. Ingham (1987). Measurement of PAH and Nitro-PAH from a Heavy-Duty Diesel Engine. *Air Pollution Control Association Paper* No. 87-1.4.
- Wall, J.C. and S.K. Hoekman (1984). Fuel Composition Effects on Heavy-Duty Diesel Particulate Emissions. *Soc. Auto. Eng. Tech. Paper* No. 841364.
- Seizinger, D.E. and S.K. Hoekman (1984). Aromatic Measurements of Diesel Fuel - A CRC Round-Robin Study. *Soc. Auto. Eng. Tech. Paper* No. 841363.
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Book Chapter

- Liu, Z., Balasubramanian, R., and Hoekman, S.K., “Production of Renewable Solid Fuel Hydrochar from Waste Biomass by Sub- and Supercritical Water Treatment.” Chapter 9 in *Near-critical and Supercritical Water and their Applications for Biorefineries*, ed. Fang, Z. and Xu, C. Springer, 2014.

Final Technical Reports

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