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Engineering & Scientific Consulting

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### Professional Profile

Dr. Clevenger's expertise focuses on materials characterization and process engineering for specialty manufacturing, with a particular emphasis on regulated products such as medical devices and pharmaceuticals.

Dr. Clevenger's physical chemistry experience is applicable to problems involving materials such as semiconductors, MEMS, metal films, dielectrics, polymers, materials processing, materials characterization, pharmaceutical process chemistry, identification of trace contaminants including organics and particulates, and corrosion processes.

His pharmaceutical experience includes process engineering and optimization for transdermal and solid oral formulations, regulatory compliance and CMC (Chemistry, Manufacturing, and Controls) related issues involving root cause analysis, corrective and preventive action plans, quality assurance, and Quality by Design initiatives. His medical device experience includes method development for regulatory submissions, product development and manufacturing support, and technology due diligence assessment.

Dr. Clevenger's characterization background encompasses a broad range of advanced technologies and techniques including laser spectroscopy, X-ray photoelectron spectroscopy (XPS), Auger spectroscopy, Raman, FTIR, solid/liquid-NMR, gas and liquid chromatography (GC/LC) with mass spectrometry (MS), optical emission/absorption spectroscopy, energy dispersive spectroscopy (EDS), white-light interferometry, spectroscopic ellipsometry, atomic force microscopy (AFM), and secondary ion mass spectrometry (SIMS). In addition, he has extensive experience with plasma chemistry and spectroscopy, thin film metrology and reliability, high vacuum technology, and semiconductor processing.

### Academic Credentials & Professional Honors

Ph.D., Physical Chemistry, Massachusetts Institute of Technology (MIT), 2002

B.A., Chemistry, Vanderbilt University, *magna cum laude* with *High Honors*, 1995

Phi Beta Kappa and Omicron Delta Kappa

Barry M. Goldwater Foundation Scholarship, Goldwater Excellence in Education Foundation, (1994)

### Prior Experience

Process Technologist (Etch and CVD), Applied Materials, Inc. (2002-2004)

## Professional Affiliations

American Association of Pharmaceutical Scientists — AAPSAmerican Chemical Society — ACS

Society of Photo-Optical Instrumentation Engineers — SPIE

## Publications

Kou PM, Clevenger JO. A coat for all weathers: A survey of the hydrophilic coatings market. *Med Device Develop* 2012; May.

Clevenger JO, Ralston B. Rapid development. *Med Device Develop* 2009; Oct.

Steffey D, Ostarello A, Clevenger J, Villarraga, M. Troubleshooting analyses of production data. *Int J Ind Eng* 2009; 16(3):206-213.

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Goldsmith C, Forehand D, Scarborough S, Peng Z, Palego C, Hwang J, Clevenger J. Understanding and improving longevity in RF MEMS capacitive switches. *Reliability, Packaging, Testing, and Characterization of MEMS/MOEMS VII, Proc. of SPIE Vol. 6884, 2008.*

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Ibarreta A, Davis S, Clevenger JO. Flammability of electrical crimp connectors subjected to heating. *Proceedings, Fire and Materials 10th International Conference, 2007.*

Kay JJ, Byun DS, Clevenger JO, Jiang X, Petrovic VS, Seiler R, Barchi JR, Merer AJ, Field RW. "Spectrum-only" assignment of core-penetrating and core-nonpenetrating Rydberg states of calcium monofluoride. *Can J Chem* 2004; 82(6):791-803.

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Generation Lithography Mask Technology X), pp. 92-100.

Li L, Dai X, Liu Y, Clevenger JO, Field RW, Jeung GH, Geum N, Lyyra AM. The Predissociation of  $1^3S_g$  State of  $^7Li_2$ . J Molecul Spectrosc 2001; 205(1):139-145.

Dai X, Clevenger JO, Liu Y, Song M, Shang J, Chen D, Field RW; Li L. The  $2^3D_g$  State of  $^7Li_2$ . J Molecul Spectrosc 2000; 200(1):120-122.

Clevenger JO, Harris NA, Field RW, Li J. The predissociation mechanism for  $2^2S +$  Rydberg states of CaCl. J Molecul Spectrosc 1999; 193(2):412-417.

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Radzykewycz DT, Littlejohn CD, Carter MB, Clevenger JO, Purvis JH, Tellinghuisen J. The  $D^1 - A^1$  transition in IBr: A deperturbation analysis. J Molecul Spectrosc 1994; 166(2):287-303.