Kurt D. Humphrey

Semiconductor Fabrication, Processing, and Chemical/Materials Expert

After graduating with his B.S. in Ceramic Engineering, Mr. Humphrey accepted a Product Development engineering position with General Motors' AC Spark Plug division where he developed and patented the seminal process for physical vapor deposition (PVD) of Pt catalytic coatings on partially-stabilized zirconia oxygen sensors for state-of-the art automotive emission control systems. Kurt was subsequently awarded a GM Graduate Study Fellowship and continued research in the area of automotive electronics with the development of **novel methods for fabricating multilayer ceramic capacitors** and other piezoelectric components through funding by General Motors Research Laboratories. After completing his M.S. degree in Ceramic Engineering, Kurt joined Delco Electronics (Delphi) Division of General Motors where he led process development and engineering in the areas of Czochralski (Cz) single-crystal silicon growth and semiconductor device/IC fabrication for bipolar, MOS, and silicon MEMS (MAP sensor) products.

Mr. Humphrey's expertise in materials and microelectronics subsequently led to assignments as Thin Films Process Development Manager where he developed and transferred to production the PVD tantalum salicide (TaSi) process used in AT&T's and Bell Labs' DRAM memory products. Kurt subsequently served as Submicron Process Integration Manager at N.V. Philips Research Laboratories in Eindhoven, NL including development of next-generation wafer cleaning, isolation, contact plug, via metallization and ILD gap-fill processes for state-of-the-art semiconductor device production. While at Philips, Kurt collaborated with engineers at AMD, Intel, TSMC, Texas Instruments, and Siemens on advanced materials development and IC process/fabrication technology through formal technology transfer agreements between the companies.

Mr. Humphrey came to Colorado Springs as Process Integration Manager for United Technologies Microelectronics Center (UMTC) developing and patenting state-of-the-art radiation-hardened triple-level metal (TLM) CMOS, programmable amorphous silicon anti-fuse, and deep-trench fully-isolated, complimentary bipolar silicon-on insulator (SOI) process technologies. Kurt transferred to Rockwell Semiconductor Systems/Conexant where he served as Advanced Process Integration Manager for 90nm CMOS pilot production. Later, with Rockwell and Conexant, Kurt developed and patented a commercial stiction-free wet etching process for releasing bulk micro-machined MEMS resonating structures used in state-of-the-art MEMS gyroscopes. During his long tenure in the industry, Mr. Humphrey worked with key semiconductor, telecom equipment and materials vendors including Applied Materials, AT&T, ASML, Ericsson, Huawei, Nokia, LAM, Novellus, ULVAC, SOITEC, Shin Etsu (SEH), JSR, Samsung, Sumitomo and many others to develop next-generation optoelectronic components, designs and fabrication technologies.

Kurt has spent the past 20 years as a full-time IP consultant and subject matter expert (SME) in microelectronics and wireless telecom technologies. Kurt has served as a consulting and/or testifying expert in multiple lawsuits including an **ITC patent infringement case between HP and Acer** and **provided trial testimony as the expert for the plaintiff (the Houston Rockets organization) v. iLight Technologies in a 2012 product liability case involving LED lighting technology in 2012**. The jury found for the Plaintiff. Most recently, Kurt has provided expert analyses, reports and declarations in support of wireless telecom IPRs instituted by the USPTO's Patent Trial and Appeal Board (PTAB). Mr. Humphrey has been engaged numerous times to provide forensic/reverse engineering services and subject matter expertise primarily in the areas of commercial and industrial electronics and high-tech materials, and has analyzed literally thousands of patents and countless patent portfolios for clients in the Global High-tech Top 100.

In addition to his consulting work, Mr. Humphrey currently serves as Adjunct Professor of Chemistry in the College of Engineering at Colorado Technical University teaching inorganic and organic chemistry.

PROFESSIONAL EXPERIENCE

IP *Enginuity* LLC. **2005-Present**

Managing Director/Principal Technologist

- Comprehensive Engineering Services Provider for the Intellectual Property and Patent Asset Management, Licensing, Litigation and Technology Transfer Industries.
- Prepare strategies and manage engineering services relating to IP asset and patent evaluation; reverse/forensic engineering and re-engineering; patent enforcement, assertion and licensing; portfolio mining; prior art searches; technology transfer; and IP litigation support.
- Primary technical contributor on projects relating to MCT/CZT IR focal plan arrays for the United Technologies Science Center, semiconductor devices and advanced/engineered materials including forensic and patent infringement investigations into LED lighting systems, LED phosphors, and solid-state DFB laser devices, organic LEDs (OLEDs) and optical networking components, protocols and standard essential patents (SEPs), consumer electronics, photonics and opto-electronic devices; MEMS and sensors; flat panel displays (FPDs), and biotech/medical products and systems.
- Expert witness experience in patent infringement litigation

TAEUS International Corp. **1999 – 2005**

Director, Engineering Services

- Managed patent evaluation and reverse engineering projects from the initial proposal through project completion and final review.
- Serve as a primary technical contributor/SME on wireless telecom/networking standards incl. 802.11, Bluetooth and 3G/4G cellular and associated SEPs, optical networking and opto-electronic/photonics components including collaboration with Dartmouth and HP scientists to measure and characterize non-linear optical effects in commercial optical fibers. Also as an SME on a variety of compound semiconductor devices, solid state DFB/quantum well lasers, photonics/opto-electronics components, FPD technologies, e.g. LCD, plasma and LED/OLED, , MEMS, sensors,) etc. and biotech related projects.
- Specific responsibilities include client interface, project definition, cost, resource and schedule planning, technical input, supervision of staff engineers, external consultants and labs, patent evaluation, claim chart construction, and technical report writing.
- Clients included many Global 100 high tech companies and leading U.S. patent law firms.

Rockwell Semiconductor Systems/Conexant Systems **1995 - 1999**

Advanced Process Development Manager

- Assess new business opportunities, perform technical audits and generate comprehensive business and financial plans for review and approval by Rockwell CEO and senior staff.
- Primary focus on state-of-the-art semiconductor products e.g., Power-Trench Diodes and Trench IGBTs, CMOS imagers and MEMS gyros.
- Coordinate design rules, mask/reticle specifications, test chip design/layout, process qualification and transfer to production for 90nm CMOS process development in Rockwell's Advanced Process Technology (APT) department in Newport Beach.

Process Integration Manager

- Demonstrated first fully-functional Trench IGBTs and silicon MEMS gyro using 125mm substrates.
- Authored 3 MEMS and 1 SAW filter disclosures; 1 MEMS patent issued, others pending.
- Successful completion of comprehensive STI and 90nm CMOS process development test chips in record time to support an aggressive 90nm qualification schedule.

United Technologies Corp. (UTMC) **1989 – 1995**

Process Integration Manager

- Direct next-generation CMOS and bipolar process technology development. Development projects included: ACUTE (advanced dielectrically-isolated, complementary bipolar linear array process on SOI), UTERPROG (radiation-hardened 1.0µ CMOS PAL technology utilizing vertical amorphous Si antifuses), and UTERTLM (1.0µ triple-level metal, rad-hard CMOS)
- Developed advanced amorphous silicon metal-to-metal antifuse technology to support 256k RHPROM and RHPAL field programmable products; 2 patents issued.
- Developed novel trench-isolated, complementary bipolar SOI process, 1 patent issued

Philips Research Labs (Eindhoven, The Netherlands) 1986 – 1989

Process Integration Manager

- Direct development of 0.7µ CMOS process from R&D phase through final product qualification as part of the Philips/Siemens "Mega" project. Project deliverables included commercial 1M SRAM and 4M DRAM products.
- Directed activities of 10 senior technologists.
- Developed first sub-micron CMOS process utilizing retro-wells, suppressed-BB LOCOS, salicide with $TiSi_2$ local interconnect, W plugs and I-line lithography.
- Integration team produced Philip's first fully-functional 1M SRAM using state-of-the-art 0.7µ CMOS process (C1DM)

AT&T Technologies 1983 – 1986

Process Engineering and Yield Enhancement Manager

- Coordinate DRAM process transfer from R&D to fab, and direct yield enhancement activities for 256k DRAM production in new 125mm line (KC-1).
- Section Leader for Thin Films/Ion Implantation Engineering
- Key contributor in successful start-up of new 125 mm high volume memory fab (KC-1);
- Representative on corporate committee for thin film metallization processes and invited speaker at SEMI/ASTM meeting on PVD target specifications.

DELCO Electronics Div. General Motors 1980 – 1983

Process Development Engineer (Silicon Crystal Growing, Bipolar and MOS Fabs)

- Provide production engineering support, initially for Si crystal growing area, and later for MOS diffusion and LPCVD areas
- Evaluated external silicon wafer suppliers and introduced intrinsic-gettered substrates into MOS fab resulting in an average 7% increase in die yield across all devices

AC Spark Plug Div., General Motors 1978 – 1980

Associate Process Development Engineer

- Developed process for depositing Pt catalytic thin films onto partially-stabilized zirconia oxygen sensors
- Key investigator and inventor on U.S. patent: "Electrode Sputtering Process for Exhaust Gas Oxygen Sensor"
- 1979 GM Graduate Study Fellowship Award

EDUCATION and ACADEMIA

M.S. Ceramic Engineering, University of Missouri - Rolla

B.S. Cum Laude, Ceramic Engineering, University of Missouri – Rolla
Adjunct Professor of Chemistry in the College of Engineering at Colorado Technical University-Colorado Springs - Current

U.S. PATENTS:

6,337,027 Microelectromechanical device manufacturing process
5,759,876 Method of making an antifuse structure using a metal cap layer
5,658,819 Antifuse structure and process for manufacturing the same
5,344,785 Method of forming high speed, high voltage fully isolated bipolar transistors on a SOI substrate
4,253,931 Electrode sputtering process for exhaust gas oxygen sensor

HONORS

General Motors Graduate Study Fellowship – 1979
United Technologies Silver Quill Award – 1994
Rockwell Outstanding Achievement Award – 1998

PROFESSIONAL MEMBERSHIPS

Institute for Electrical and Electronics Engineers (IEEE) / Electron Devices Society
Colorado Photonics Industry Association
Licensing Executive Society (LES)
Intellectual Property Owners Association (IPO)
Society for Optical Engineering (SPIE)
Intellectual Asset Management (IAM)

Expert Litigation Case History (Partial)

2007 – ITC Case No. 337-TA-606, *Hewlett Packard (Plaintiff) v. Acer International*:
Provided expert reverse engineering services, expert report and deposition for the Plaintiff

2012 – District Court 157th Judicial District Harris County Texas Cause No.2009-76645, *Clutch City Sports and Entertainment a.k.a. Houston Rockets (Plaintiff) v. iLight Technologies*:
Provided expert failure analysis services, expert report, deposition and trial testimony for the Plaintiff. Jury chose in favor of the Plaintiff.

2018 – IPR Case IPR2017-001889 before the USPTO PTAB, *Sprint Spectrum v. General Access Solutions (Patent Owner)*:
Provided expert declaration and was deposed on behalf of the Patent Owner

2020 - IPR Case IPR2019-01668 before the USPTO PTAB, *Samsung Display (Petitioner) v. Solas OLED (PO)*: Provided expert declaration in support of the Patent Owner

2021 – Western District of Texas Civil Action No.: 6:20-cv-879 (ADA), *Proxense LLC (Plaintiff) v. Target Corp.*: Provided expert declaration and deposed on behalf of the Plaintiff

2021 - Middle District of Florida, Tampa Division, Case No. 8:20-cv-02274, *Rebotix Repair LLC (Plaintiff) v. Intuitive Surgical, Inc.*:
Provided expert report and expert deposition on behalf of Plaintiff

2021 – Southern District of Iowa Central Division, Case No. 4:19-cv-00330-RGE-CFB, Neogen Corp. v. Innovative Reproductive Technology LLC: Provided expert report, scheduled for trial testimony in June

2022 - IPR Case IPR2021-00929 before the USPTO PTAB, *Western Digital Technologies (Petitioner) v. Ocean Semiconductor (PO)*: Provided expert declaration and deposition in support of the Patent Owner