

Exponent®
Engineering & Scientific Consulting

Gretchen Tibbits, Ph.D.

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Professional Profile

Dr. Tibbits is a leading expert in electrochemistry, corrosion science, and materials characterization at Exponent. She specializes in the identification and evaluation of material degradation and failure mechanisms across medical devices, consumer products, and secure identification technologies.

Dr. Tibbits has technical knowledge relating to microsensors, biohazard materials, and electroceutical medical devices. Her core competencies include:

- **Corrosion Engineering:** Localized, galvanic, atmospheric, and electrochemically induced corrosion.
- **Standardized Testing:** Extensive experience with ASTM methods to assess material compatibility (e.g. ASTM F2129 and F3306) and device durability (ISO/IEC 10373, INCITS ANSI 322, and ISO/IEC 18745).
- **Root Cause Analysis:** Investigating contributing factors to product failure, including design, manufacturing, and environmental.
- **Materials Characterization:** Expertise in scanning electron microscopy (SEM) and energy dispersive X-Ray spectroscopy (EDS).

Dr. Tibbits earned her Ph.D. from Washington State University as a Department of Energy (DOE) Nuclear Energy Radiochemistry Fellow. Her doctoral research focused on electrochemical assays for antibiotic susceptibility, the corrosion of orthopedic implants, and the development of thin-film microsensors. She has contributed significantly to the field of infection prevention using antibiotic-alternative methods and electroceutical product development.

Medical Devices

Dr. Tibbits supports medical device companies throughout the product lifecycle, from development and FDA submission to post-market failure analysis, by applying a strong foundation in corrosion and electrochemistry. In this role, her work spans product development (material selection and design support), regulatory support (corrosion and durability evaluations for FDA submissions), and failure analysis (root-cause investigations of explanted devices). Corrosion resistance and durability are critical

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factors in assessing the performance of implantable medical devices, particularly during regulatory submissions (for instance, those associated with a ISO 10993 Biological Evaluation Report).

Dr. Tibbits has experience with many different medical device designs, such as cardiovascular implants, neurostimulators, stents, and catheters, from product development to failure analysis. These devices typically consist of stainless steel, titanium, cobalt-chrome, and nitinol alloys. Dr. Tibbits provides expertise in evaluation of the corrosion resistance or susceptibility of materials that interact directly with the human body.

Consumer Products and Consumer Electronics

Dr. Tibbits conducts failure investigations of household consumer products and electronic devices, integrating materials analysis with an understanding of product design. These investigations often address potential safety concerns, recall considerations, and product liability issues by identifying root causes of material or design-related failures.

Secure Identification Technologies

Dr. Tibbits applies expertise in corrosion, electrochemistry, materials characterization, and standardized testing to evaluate and improve the reliability, interoperability, and security of secure identification technologies. These projects leverage analytical techniques (such as SEM, EDS, and electric circuit probing) as well as an understanding of the end user purpose to conduct root-cause investigations and evaluate new products.

She is an active member of the ISO/IEC WG1 committee on physical characteristics and test methods for identification cards, where she contributes to the development of new test methods and materials. This work helps advance international standards and ensures emerging products meet rigorous performance expectations.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, Washington State University, 2022

B.S., Chemical Engineering, Washington State University, 2018

Department of Energy Nuclear Energy Nuclear and Radiochemistry Fellowship

Professional Affiliations

LifeScience WA member

Women in Bio member – Seattle and San Francisco

Bits in Bio member

Standard Committee Member

ISO/IEC JTC 001/SC 17/WG 01 "Physical characteristics and test methods for ID-cards" Member

Publications

Efficacy and toxicity of hydrogen peroxide producing electrochemical bandages in a porcine explant

biofilm model. J Appl Microbiol. 2022 Dec;133(6):3755-3767. doi: 10.1111/jam.15812. Epub 2022 Sep 22. PMID: 36073322; PMCID: PMC9671841.

G. Tibbits, A. Mohamed, D. Call, H. Beyenal, Rapid differentiation of antibiotic-susceptible and –resistant bacteria through mediated extracellular electron transfer, Biosensors and Bioelectronics, 2021.

Mohamed A, Anoy MMI, Tibbits G, Raval YS, Flurin L, Greenwood-Quaintance KE, Patel R, Beyenal H. Hydrogen peroxide-producing electrochemical bandage controlled by a wearable potentiostat for treatment of wound infections. Biotechnol Bioeng. 2021 Jul;118(7):2815-2821. doi: 10.1002/bit.27794. Epub 2021 May 3. PMID: 33856049.

Interactions between Hyaluronic Acid and CoCrMo-Alloy Surface in Simulated Synovial Fluids" by Radice, Simona; Tibbits, Gretchen; Lin, Alex; Beyenal, Haluk; Wimmer, Markus. Biosurface and Biotribology, 2021.

G. Tibbits, N.A. Wall, S. Saunders, J. Babauta, H. Beyenal, Electrochemical detection of flavin mononucleotide using mineral-filmed microelectrodes, Journal of Electroanalytical Chemistry, Volume 892, 2021, 115307, ISSN 1572-6657.

Medina AS, Tibbits G, Wall NA, Ivory CF, Clark SB, Beyenal H. Electrochemical precipitation of neptunium with a micro electrochemical quartz crystal microbalance. J Radioanal Nucl Chem. 2020 Jun;324(3):1021-1030.

Presentations

Tibbits, G.; Wall, N.A.; Saunders, S.; Babauta, J.; Beyenal, H. Thin Hematite Film Based Flavin Microsensor. Oral presentation, 235th Electrochemical Society Conference, Dallas, TX, 2019.