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Engineering & Scientific Consulting

Chris Berkey, Ph.D.

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Professional Profile

Dr. Berkey is a materials engineer with expertise characterizing thin-film adhesion failure caused by mechanical damage and environmental degradation from sources like ultraviolet light, heat, and chemical species. His work spans biological and inorganic systems, specializing in biomechanical and chemical barrier properties of human skin as well as layered structures in electronic devices. He bridges the diversity in material systems with extensive experience in mechanical analysis techniques, adaptable experimental design, method development, and spectroscopies such as Fourier-transform infrared (FTIR) and Raman. His technical interests include wearable device technologies such as next-generation sensors or trans-dermal drug delivery systems, which lie at the thin-film interface of biological tissue and electronics.

Prior to joining Exponent, Dr. Berkey performed postdoctoral research at Stanford University where he prototyped thin, flexible adhesive armor appliques that reduced projectile impact injuries to the face and extremities. He designed IRB-approved human clinical trials to ensure applique prototypes maintained adhesion and user comfort during normal daily activities. Additionally, Dr. Berkey obtained his Ph.D. from Stanford University, where he developed a quantitative connection between commercial skin-care formulation penetration into the skin, consequently reduced biomechanical stress, and enhanced perceptions of comfort in product consumers.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, Stanford University, 2019

B.S., Materials Science and Engineering, University of Maryland, College Park, 2014

IFSCC Applied Research Award, 32nd IFSCC Congress in London, UK, 2022

1st Prize in the ASM Undergraduate Design Competition, UMD College Park, 2014

Dinah Berman Memorial Award, UMD College Park, 2013

Prior Experience

Postdoctoral Scholar, Stanford University, 2019-2022

Publications

Berkey CA, Styke C, Yoshitake H, Sonoki Y, Uchiyama M, Dauskardt RH. “Carbon dioxide foam bubbles enhance skin penetration through the stratum corneum layer with mechanical mechanism.” Colloids and

Surfaces B: Biointerfaces, Volume 231, (2023), 113538.

Berkey CA, Elsafty O, Riggs MM, Dauskardt RH. Characterization and modeling of partial-thickness cutaneous injury from debris-simulating kinetic projectiles. Communications Engineering. 2022; 1(33).

Berkey CA, Biniek K, Dauskardt RH. Predicting hydration and moisturizer ingredient effects on mechanical behavior of human stratum corneum. Extreme Mechanics Letters. 2021; 46(101327).

Berkey CA, Kanno D, Mehling A, Koch JP, Eisfeld W, Dierker M, Bhattacharya S, Dauskardt RH. Emollient structure and chemical functionality effects on the biomechanical function of human stratum corneum. International Journal of Cosmetic Science. 2020; 42:605-614.

Hu B, Berkey CA, Feliciano T, Chen X, Li Z, Chen C, …, Dauskardt RH, Chen X. Thermal-disrupting interface mitigates intercellular cohesion loss for accurate topical antibacterial therapy. Advanced Materials. 2020; 32(1907030).

Berkey CA, Oguchi N, Miyazawa K, Dauskardt RH. Role of sunscreen formulation and photostability to protect the biomechanical barrier function of skin. Biochemistry and Biophysics Reports. 2019; 19(100657).

Berkey CA, Biniek K, Dauskardt RH. Screening sunscreens: protecting the biomechanical barrier function of skin from solar ultraviolet radiation damage. International Journal of Cosmetic Science. 2017; 39:269-274.

Presentations

Lovald, S., Berkey, C., Pak, N., Gorji, M., Rau, A. Finite Element Analysis of Skin Deformation and Puncture for Microneedle Array Design. Presentation at 2023 Parenteral Drug Association Universe of Pre-Filled Syringes and Injection Devices Conference, Gothenburg, Sweden, Oct. 17-18, 2023.

Lovald, S., Berkey, C., Pak, N., Gorji, M., Rau, A. Finite Element Analysis of Skin Deformation and Puncture for Full Microneedle Arrays. Presentation at Microneedle & Intradermal Delivery Forum 2023, Philadelphia, PA, Sept. 18-19, 2023.

Berkey CA, Mehling A, Suckert A, Dierkey M, Riedel H, Koch J, Guo Y, Crotogino J, Albers T, Dauskardt RH. Exploiting ingredient interactions to deliver optimal performance of skin-care formulations. Podium presentation, 32nd IFSCC Congress, London, UK, 2022.