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Engineering & Scientific Consulting

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Professional Profile

Dr. Nejad is a polymer scientist specializing in design, manufacture and characterization of specialty chemicals and formulations utilized in many industries including cosmetics, pharmaceuticals, medical devices, flexible electronics, coatings and adhesives. With prior experience in the chemical industry, Dr. Nejad directs clients on topics related to molecular design (chemistry), material selection and formulation, failure analysis, regulatory compliance, end-use testing, scale-up and intellectual property matters.

Dr. Nejad has studied the physical and chemical behavior of various polymeric products including elastomers, thermoplastic polyurethanes (TPUs), biocompatible polymers, hydrogels, epoxies, adhesives, rubbers, thermosets and composites. He is well-versed in the development and evaluation of topical formulations for both cosmetics and pharmaceutical industries. His specialties include evaluation, quality control, regulatory compliance and stability study of excipients, actives and full formulations such as emulsions (lotion, cream), hydrogels, sprays, ointments and mucilage. He has applied such expertise in industries including pharmaceutical, skincare, color cosmetics, bath and shower, home care and sun care. Specifically, he is experienced with in-vitro and in-vivo SPF and water resistance measurement techniques (FDA and ISO) for sun care formulations. He has also worked on oral solid dosage forms and transdermal drug delivery systems including drug-in-adhesive, iontophoresis and microneedle-based products.

Dr. Nejad has substantial experience with several material processing techniques such as extrusion, compression molding, thermoforming, lamination, electrospinning, spin-coating, spray coating, knife-over roll coating and melt-spinning to develop various polymeric composite forms (e.g. fibers, films and foams). To solve complex problems, he routinely employs material characterization techniques including rheometry, thermal, mechanical, microscopy, spectroscopy, chromatography as well as surface and interfacial analyses.

Prior to joining Exponent, Dr. Nejad worked as a senior scientist in Lubrizol Advanced Materials where he led efforts related to innovation, technology identification, product development, technical marketing, customer support and intellectual property analysis. Dr. Nejad has patented several technologies in cosmetics, transdermal drug delivery, polymer processing and polymer composites industries. He has presented in many conferences, authored and reviewed peer-reviewed journal articles focused on a wide range of topics including cosmetics, topical formulations, medical devices, transdermal drug delivery, shape memory and self-healing composites, materials characterization, polymer processing and surface characterization.

Academic Credentials & Professional Honors

Ph.D., Bioengineering, Syracuse University, 2015

B.Sc., Chemical Engineering, Tehran University, 2010

Licenses and Certifications

Licensed Professional Engineer, Maryland, #56767

Prior Experience

Senior Scientist, Lubrizol Life Science (2016-2020)

Postdoctoral Scientist, Lubrizol (2015-2016)

Professional Affiliations

American Chemical Society (ACS)

Materials Research Society (MRS)

Society of Cosmetic Chemists (SCC)

Patents

US Provisional Patent Filed, Water-Resistant and/or Photoprotective Compositions Comprising Non-Solubilized Micronized Waxes, October 2019, (H.B. Nejad, A. Lubnin, L. Blasco & B. Moran)

WO2019079291A1, Device for Delivery of Active Agents to Skin Surfaces, August 2018 (N. Marchant, T. Beckert, J. Heinzelmann, A. Schottner, J. Stehle, Q. Tang, H.B. Nejad & M. Ramadan)

US 10,125,233 Triple Shape Memory Composite Foams, August 2017 (H.B. Nejad, R.M. Baker & P.T. Mather)

Disclosed to Syracuse University, Interwoven Self-Healing Composites, May 2015 (H.B. Nejad and Patrick T. Mather)

Publications

Google Scholar Page:

[Link](#)

PhD Dissertation:

Thermally/Mechanically Responsive Polymeric Composites with Shape Memory/Self-Healing Properties, *Department of Biomedical and Chemical Engineering, Syracuse University*

H.B. Nejad, L. Blasco, B. Moran, J. Cebrian, J. Woodger, E. Gonzalez, C. Pritts & J. Milligan, "Bio-Based Algae Oil: An Oxidation and Structural Analysis", *International Journal of Cosmetic Science* (2020)

H.B. Nejad, M.A. Paczkowski, Y. Malajati & R.B. Melkowitz, "Polyurethane Rheology Modifiers for Organic Compositions", *Journal of Applied Polymer Science* (2018)

M. Tamami, H.B. Nejad, et. al., "Multifunctional Polyurethane for Personal Care, Home Care, Health Care and Institutional Care Formulations", *IP.com Prior Art Database Technical Disclosure* (2017)

H.B. Nejad, K.L. Garrison & P.T. Mather, "Comparative Analysis of Shape Memory- Based Self- Healing Coatings", *Journal of Polymer Science Part B: Polymer Physics* (2016)

H.B. Nejad, J.M. Robertson & P.T. Mather, "Interwoven Polymer Composites via Dual- Electrospinning with Shape Memory & Self-Healing Properties", *MRS Communications* (2015)

J.M. Robertson, H.B. Nejad & P.T. Mather, "Shape Memory Thermoplastic Elastomers via Dual Electrospinning", *ACS Macro letters* (2015)

H.B. Nejad, A.H. Torbati, M. Ponce, J.P. Sutton & P.T. Mather, "Properties of Triple Shape Memory Composites Prepared via Polymerization-Induced Phase Separation", *Soft Matter* (2014)

H.B. Nejad, R.M. Baker & P.T. Mather, "Preparation and Characterization of Triple Shape Memory Composite Foams", *Soft Matter* (2014)

Q. Ge, X. Luo, C.B. Iversen, H.B. Nejad, P.T. Mather, M.L. Dunn & H.J. Qi, "A Finite Deformation Thermomechanical Constitutive Model for Triple Shape Polymeric Composites Based on Dual Thermal Transitions", *International Journal of Solids & Structures* (2014)

Presentations

Hydrophobic Rheology Modifier in Sunscreen Formulations, Sunscreen Symposium 2019

Innovative Multi-Functional Rheology Modifier Chemistry for Oil-based Formulations, International Federation of Society of Cosmetics Chemists (IFSCC) 2018

Shape memory thermoplastic elastomers via dual electrospinning (ACS) 2015

New Triple Shape Memory Composite Foams, American Chemical Society (ACS) 2014

Project Experience

TPU Based Medical Device Failure Analysis:

Analyzed polyether based thermoplastic polyurethane (TPU) resins and extruded films used in a medical device to investigate mechanism of failure based on resin or thermal processing parameters.

Adsorption Evaluation of Catalyst:

Analyzed adsorption of exemplar vs. field micropore zeolite used in automobile catalyst using thermogravimetric analysis (TGA) to determine the effect of processing conditions such as pre-treatment temperature and low temperature water degradation (LTWD) on ethane fractional uptake of zeolite samples.

Natural SPF Booster Platform:

Invented technology for natural based SPF boosters, technical lead and project manager for product development from early development to launch, conducted prior art search and filed IP, designed product brochure and customer presentations; developed sunscreen formulations, conducted in-vitro, in-vivo SPF and sensory evaluations testing of natural reef-safe formulations

Natural Moisturizing Emollient:

Performed compositional analysis of a fermentation derived triglyceride with GC and NMR, evaluated oxidation stability of emollient using PDSC and Rancimat techniques, prepared technical marketing presentations to preview customers, developed 100 % natural skincare prototypes as a part of launch package, designed and managed an *in-vivo* sensory, skin hydration (corneometer) and transepidermal water loss (TEWL) (Vapometer) studies.

Dermal Care Formulation Development:

Technical lead for drug-in-adhesive transdermal patch from development to commercialization, literature reviewed current techniques in the field such as permeation enhancers-microneedles-iontophoresis, supervised *in-vitro* & *in-vivo* Franz cell studies, managed an FDA compliant/validated stability study, reviewed FDA regulatory requirements, prior art landscape review and IP filing.

Facemask Polyurethane Film:

Developed high water adsorbent swelling polyurethane films, evaluated water and active uptake and delivery to dermis layer, studied cosmetics active delivery to stratum corneum (SC), dermis and epidermis layers.

Rheology Modifiers Platform:

Product development, synthesized polyurethanes as rheology modifiers (thickeners), studied structure-function relationship of polyurethanes using rheology, thermomechanical techniques, ATR-FTIR, microscopy techniques, developed new generation of skin care, sun care and pharmaceutical topical products, evaluated SPF boosting, film former and sensory properties of the polymer in anhydrous, O/W and W/O emulsions.

Triple/Multiple Shape Memory Composites:

Invented epoxy-based composites/foams with the ability to exhibit 3/multiple shape changes, characterized their morphological and thermomechanical properties using DSC, DMA and TGA.

Curing Kinetics and Polymerization Induced Phase Separation of Thermoplastic/Thermoset systems:

Characterized curing kinetics of various epoxy systems by DSC and estimated the activation energy, curing rate, measured gelation and phase separation time by rheology.

Smart Self-Healing Coatings:

Developed corrosion resistance epoxy based adhesive coatings featuring self-repair properties for naval applications.

Dual Electrospinning for Interwoven Polymer Composites:

Invented interwoven polymeric composites for self-healing/triple shape memory purposes. Studied drug release of fiber mats as a wound dressing.

Multiscale Self-Healing Fiber-Reinforced Composites:

Electrospun novel core-sheath fibers containing epoxy/hardener based self-healing agents as core, studied fibers morphology with SEM and TEM, studied reduction in epoxy system curing time in the presence of "curing accelerator" using DSC and rheology.

Peer Reviewer

Journal of Applied Polymer Science

Polymer Reviews

ACS Macro Letters

Chemistry of Materials