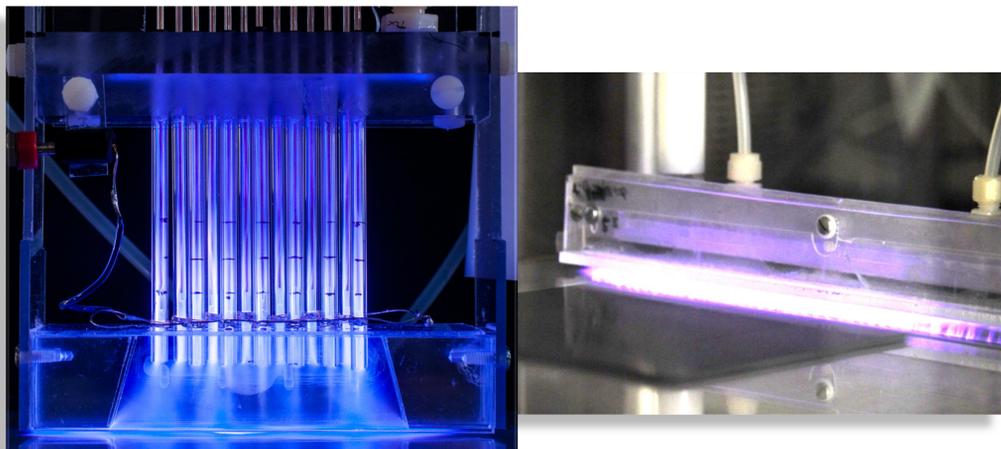


S&T Campaign: Materials Research
Manufacturing Science
Energy Coupled-to-Matter

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Research Objective

- Utilize novel atmospheric plasma processing methods to enhance performance of ceramic, metallic, polymeric, and composite materials systems.
- Make strides towards understanding the role of atmospheric plasma exposure in altering the near-surface and interfacial chemistry of materials.



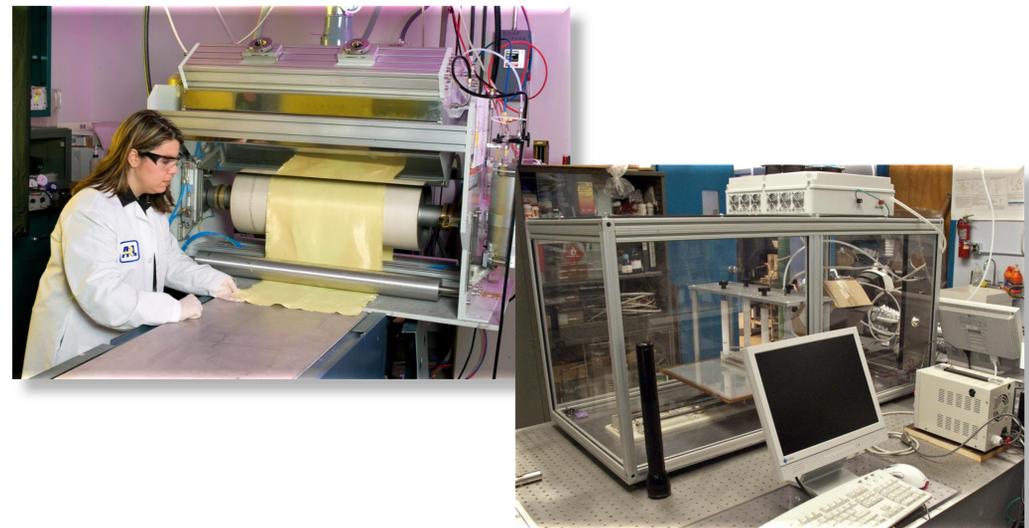
Various electrode designs for atmospheric plasma processing including plasma jet (left) and linear DBD (right).

Challenges

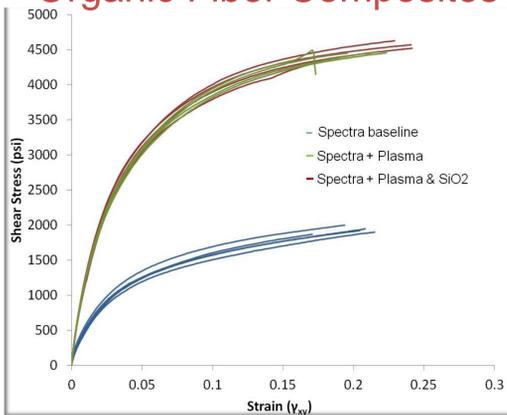
- Reproducibility of experimental conditions
- Post-treatment recovery and contamination
- Complex chemical interactions and metastable species

ARL Facilities and Capabilities Available to Support Collaborative Research

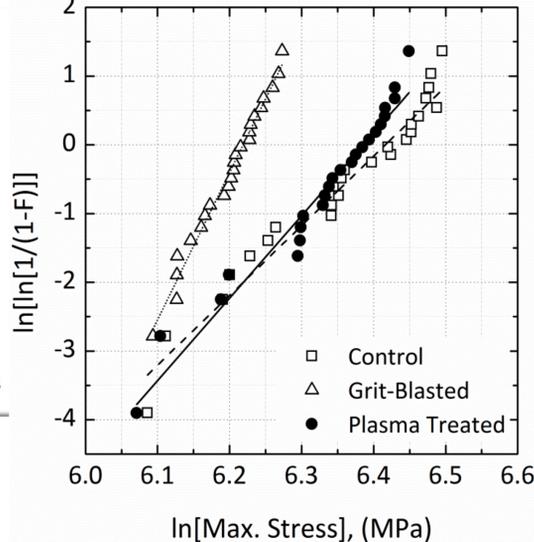
- Cylindrical RF Dielectric Barrier Discharge (DBD) system for processing fabrics and polymeric films.
- Roll-to-roll processing capability with fully automated wind/unwind system.
- Microsecond-pulsed DBD planar system for processing ceramics, polymers, and composites.
- Pulsed DBD afterglow system, allowing the treatment of conductive materials.
- Plasma-enhanced chemical vapor deposition (PECVD)
- Optical emission spectroscopy (OES) capabilities
- High-Speed photography for plasma characterization



Organic Fiber Composites

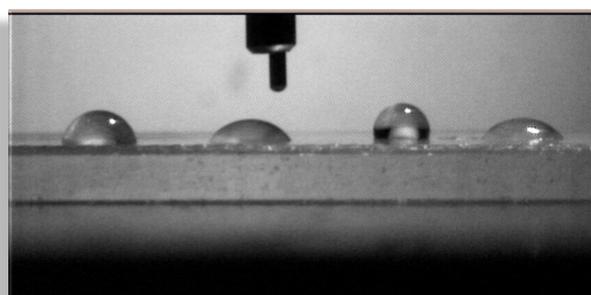


Ceramics

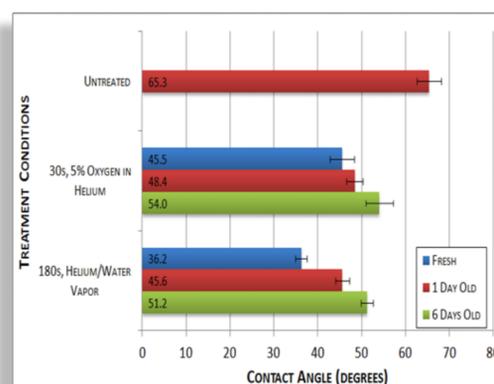


Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Power supply design for ultra-fast pulsed (nanosecond) plasma reactors.
- Electrode design for mitigation of microdischarges
- Modeling of atmospheric plasma reactions
- Atmospheric residual gas analysis (aRGA)
- Process/property relationship of PECVD films



Patterning



Thermoplastics

