

Water-Based, Environmentally-Benign, Polyelectrolyte-Based Flame Retardant Treatments for Aircraft Foam and Textiles

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Abstract

Flame retardants mitigate the threat of fire from inherently flammable materials responsible for sustaining a high standard of living. Although bulk flame retardants have proven effective for many years, there is now increased interest in the use of surface treatments to localize flame retardant chemistry at the exterior of a material, where combustion occurs. These water-based coatings preserve desirable bulk properties and minimize the amount of additive needed. The success of these treatments depends on the scalability, durability, and efficacy.

Our work in the fields of layer-by-layer (LbL) assembly and polyelectrolyte complexation has provided new water-based coating technologies for imparting effective flame retardancy to polymeric materials without using environmentally harmful chemistries [1][2]. These water-based coatings are very thin (typically < 500 nm thick) and conformal. The ability to place flame retardant chemistry exclusively at the surface prevents loss of beneficial bulk properties and reduces the amount of flame retardant required to achieve self-extinguishing behavior. These water-based treatments impart self-extinguishing behaviour, with relatively low weight gain, to a variety of polymeric film, foam, and textiles used in the aircraft industry (or would like to be used).

References

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- [2] K. M. Holder, R. J. Smith, J. C. Grunlan, *J. Mater. Sci.* 2017, 52, 12923-12959.

Biographical Summary

Professor Jaime Grunlan is the Leland T. Jordan '29 Chair of Mechanical Engineering at Texas A&M University, where he has worked for 18 years. He holds joint appointments in the Department of Materials Science and Engineering and the Department of Chemistry. Dr. Grunlan received his PhD in Materials Science and Engineering from the University of Minnesota – Twin Cities in 2001. He is a world leader in environmentally-benign, flame retardant nanocoatings. He holds 14 issued U.S. patents and several EU patents that have been licensed to more than 10 companies. He has published more than 180 journal papers, with an h-index of 61 and more than 21,000 citations. Dr. Grunlan has graduated 26 PhD students. He is an Editor of the *Journal of Materials Science* (SpringerNature), Associate Editor of *Green Materials* (ICE Publishing), and serves on the International Advisory Board for *Macromolecular Rapid Communications* and *Macromolecular Materials and Engineering* (Wiley). In 2018, Prof. Grunlan became a Fellow of the American Society of Mechanical Engineers (ASME) and was awarded a doctorate honoris causa (i.e. honorary doctorate) from the University of South Brittany (Lorient, France). In 2019, he became a Senior Member of the National Academy of Inventors (NAI).