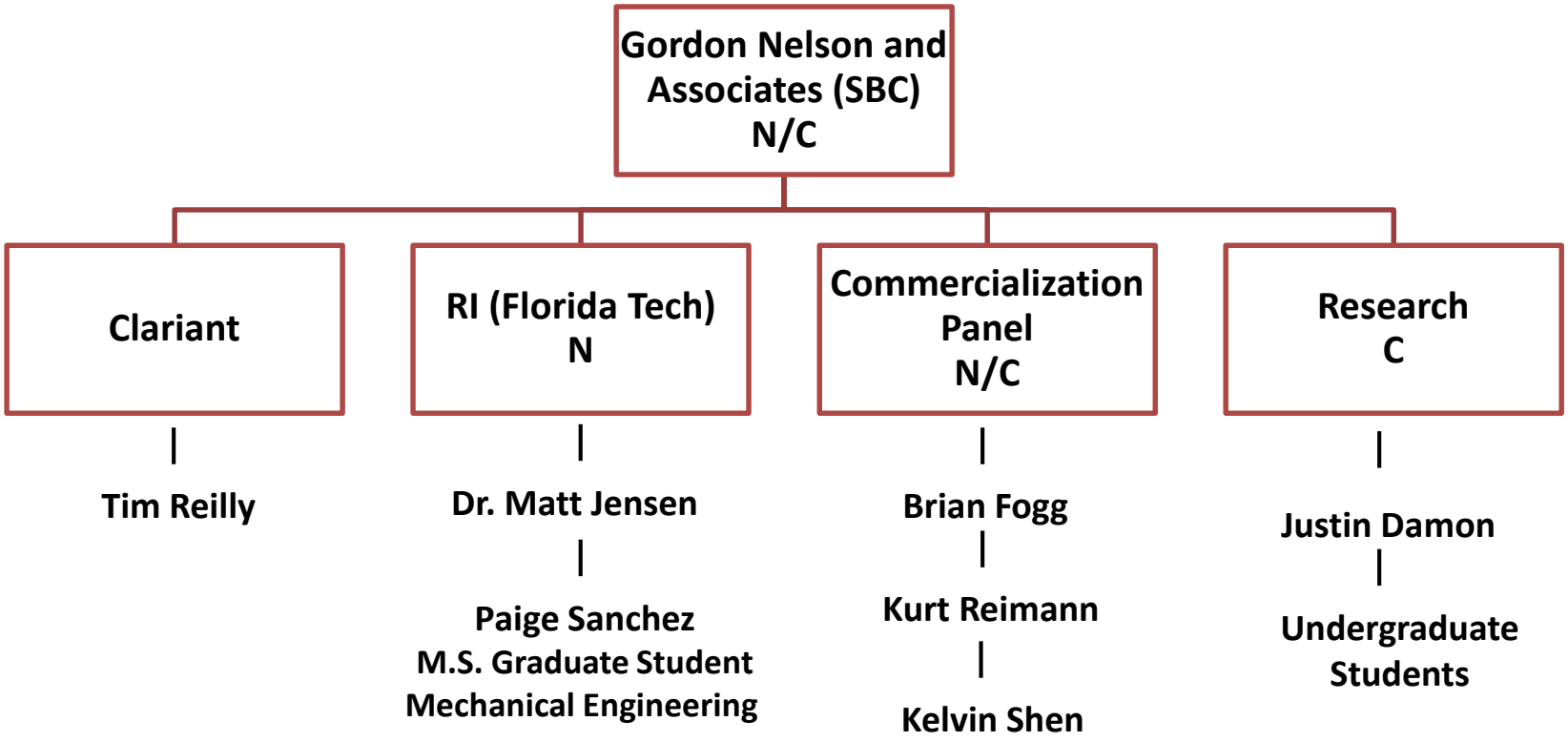
New Flexible FR Polyurethane Foams for Energy Absorption Applications

NASA STTR Phase II E



N = NASA Grant
C = Clariant Grant

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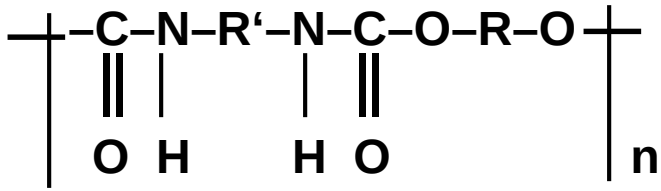
Polyurethane Chemistry



OCN-R'-NCO OH-R-OH

Diisocyanate + Polyol → Polyurethane

OH-FR-(P)-OH

Bound in, no migration

- **Non-halogen**
- **Make as FR as we can**
- **Low VOC**

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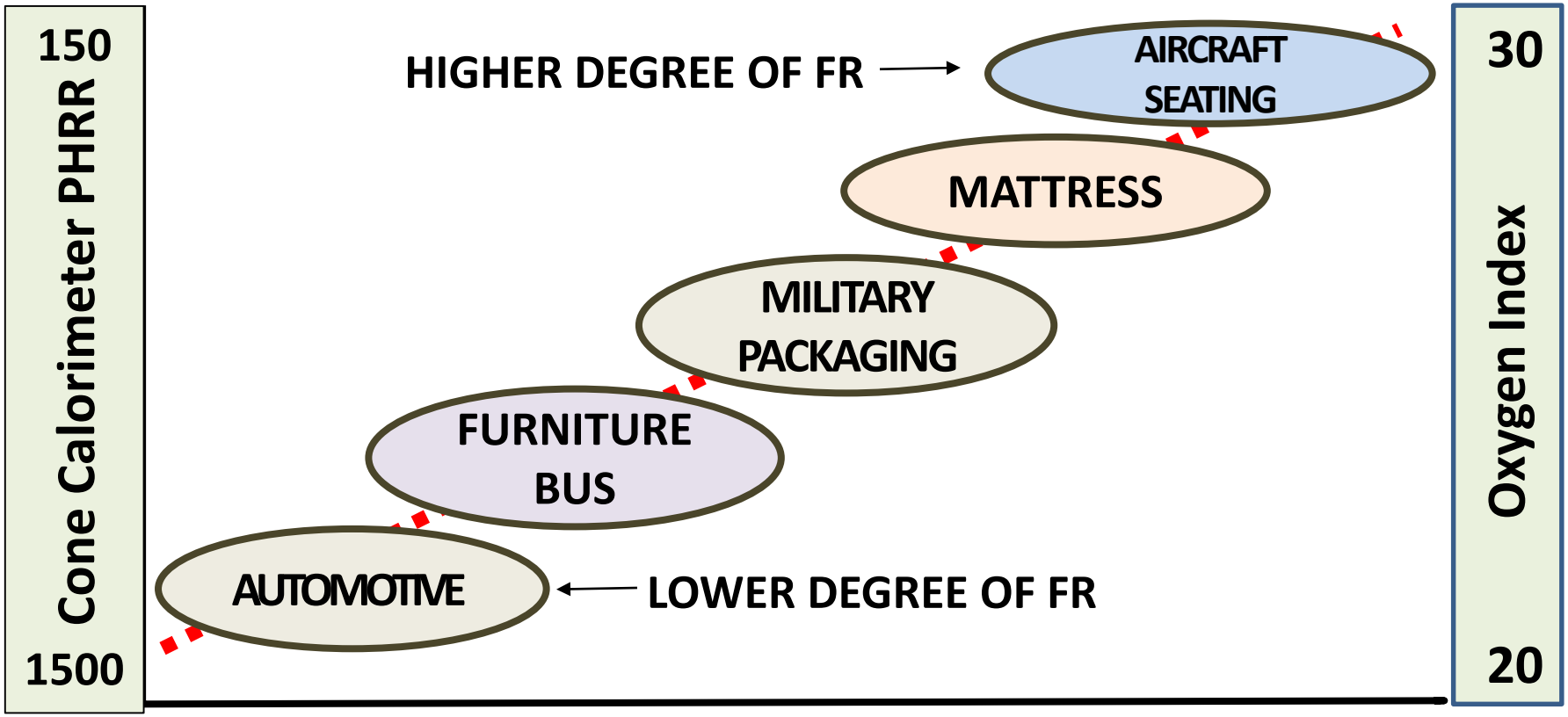
Association Between Application and Requirements
Oxygen Index and Cone Calorimeter



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NFPA 267

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Accomplishments…

Attribute	Benefit
• Highly flame retardant	• Pass wide range of tests, w/o barriers
• Non-halogen	• Human health, environment
• Non-migrating	• Green chemistry
• Low VOC	• Human health, indoor air quality
• MDI based	• Emerging trend
• High support factor	• Design freedom
• Cryo insulation at soft vacuum	• Special applications
• Commercially available raw materials	• Economically viable, cost competitive
• Compatible w/ conv. production	• Ready to run

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Commercialization Panel

Kelvin K. Shen, Ph.D.

Dr. Kelvin Shen is a technical and marketing consultant for fire retardant chemicals. His last industrial position was Sr. Global Market Development Manager of Fire Retardant Industry at Rio Tinto Minerals (former U.S. Borax/ Luzenac). He has worked on fire retardant research and market development since 1980. He was a Board Member of the Fire Retardant Chemical Association during 1990-1992.

Kurt Reimann, Ph.D.

Kurt was the Manager of the Polymer Physics Group in BASF Corporation before retirement after 25 years of service. He participated in a number of industry groups and trade associations and was Chair of both the Alliance for the Polyurethanes Industry Combustibility Issues Management Group and the International Isocyanate Institute's Fire Science Task Force. He has received recognition for his industry contributions including the Polyurethane Foam Association's Lifetime Achievement Award.

Brian Fogg

Brian has over 40 years experience in the polyurethanes industry in a wide variety of technology and application areas. His career with IC Polyurethanes and Huntsman Polyurethanes has included assignments in many geographic regions of Europe and the Americas (actual work experience in over 50 countries). He is able to translate this complex chemistry into its understandable use and applications.

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