

Carbon Fiber for Tomorrow – A Review of Current Technologies and the Path to Wide Spread Industrial Growth

The elevated mechanical properties and low mass of carbon fiber make it an attractive potential material for a number of high volume applications. Industries with potential interest include automotive, wind energy, infrastructure, ground and sea based defense, bio-energy, oil and gas, bio-fuels and sporting goods. The high cost, low relative volumes available and inexperience of many industries with carbon fiber, present significant obstacles to incorporating this material in future structures. This short course will review how pitch, PAN and rayon based carbon fibers are currently used and common manufacturing methods for producing carbon fibers from these precursors. The course will then address individual market sectors that could see wide spread penetration by carbon fiber composites and highlight some of the current obstacles to widespread adaptation for those industries. The course will next give a breakdown of where and what the costs are for producing PAN based carbon fiber and highlight on-going efforts, to reduce these costs. It will also explore other non-cost obstacles to incorporating carbon fiber in high volume industries and what is being done globally to address those. The course will include:

- The History of Carbon Fiber and Who are the Players
- Production Methods for Converting Pitch, PAN and Rayon to Carbon Fiber
- Current Applications for Carbon Fiber
- Future Industries with Potential for Growth of Carbon Fiber Composites
- Entering the Business? PAN Carbon Fiber Production Costs
- Current Technical and Non-Technical Efforts to Reduce Costs
- Other Market Penetration Obstacles

Carbon Fiber Overview Short Course Schedule

Instructor Team: Dave Warren, Mohamed Abdullah, Fred Baker, Nidia Gallego, Amit Naskar, Felix Paulauskas, Cliff Eberle, Soydan Ozcan

Introductions (Scott Stephenson) – 5 min 8:00-8:05

Course Overview – (Dave Warren) – 5 min 8:05 – 8:10

History of Carbon Fiber – Pitch, PAN & Rayon (Mohamed Abdullah) – 20 min 8:10 – 8:30

Rayon Fiber Applications, Advantages & Limitations (Warren or TBD) – 10 min 8:30 – 8:40

Pitch Precursor Spinning & Conversion (Fred Baker) – 15 min 8:40 – 8:55

Current & Future Pitch Based Fiber Applications, Advantages, & Limitations (Nidia Gallego) – 10 min 8:55 – 9:05

PAN Precursor Spinning (Amit Naskar) – 15 min 9:05 – 9:20 PAN

Precursor Conversion (Felix Paulauskas) – 20 min 9:20 – 9:40 Break 9:40 – 10:10

Current & Future PAN Based Fiber Applications, Advantages & Limitations (Cliff Eberle) – 15 min 10:10 – 10:25

Entering the Business? - PAN Carbon Fiber Production Costs (Dave Warren) – 25 min 10:25 – 10:50

Novel & Unique Carbon Fibers and Fiber Forms (Soydan Ozcan) – 15 min 10:50 – 11:05

Current ORNL Development Efforts – 10 min each except last is 5 min – 55 min 11:05 – 12:00

1. Lignin Based Precursors (Fred Baker)
2. Textile Based Precursors (Cliff Eberle)
3. Advanced Oxidative Stabilization (Felix Paulauskas)
4. Microwave Assisted Plasma Carbonization (Felix Paulauskas)
5. Surface Compatibility (Soydan Ozcan)
6. Future Directions (Dave Warren)

Instructor team stays afterward to answer questions.