

HANDOUT 2

Collaborative Opportunities for Materials & Manufacturing Research

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Arkansas State University



ARKANSAS STATE
UNIVERSITY

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Strong Ties to Arkansas

- Raised in rural Independence County
- University of Arkansas Alum
 - BSME (2009)
 - MSME (2012)
 - Ph.D. (2017)
- Initial Career Path: Tech Entrepreneurship
 - Senior Research Engineer @ WattGlass (2015-2019)
 - NSF SBIR Phase I, Ib, II, and IIb
 - DOE SunShot
 - Led industry/DOE National Lab collaborations
 - SLAC National Accelerator Lab, Sandia National Lab, Florida Solar Energy Center



Regional Engineering Innovation Needs

NEA is a major manufacturing hub

- Nestle
 - Post
 - Unilever
 - Frito-Lay
 - Nice-Pak
 - CAMFIL
 - ABB
 - Denso
 - Envirotech*
 - Big River Steel
 - Nucor
 - Nucor-Yamato
 - US Steel*
 - Southern Cast
 - Tenaris
- Consumer Goods
- Industrial & Automotive
- Metallurgy & End-use Metal Products

PFI-RP: Low-Friction Durable Coatings for Improving Energy Efficiency in Conveyor Systems

- \$550k award through the NSF Partnerships for Innovation (PFI) program
 - Commercialization of new intellectual property derived from NSF-funded research
 - Create new collaborations with industry
 - Entrepreneurship training for future leaders in innovation



Fleming Research will Investigate Coatings

Congratulations to **Dr. Robert (Drew) Fleming**, assistant professor mechanical engineering, whose proposal to the National Science Foundation's Partnerships for Innovation (PFI) has been funded for approximately \$120,000. He will be co-principal investigator for a broader project led by a University of Arkansas professor. Working with Hytrol Conveyor Inc. as an industrial partner, Fleming will investigate low-friction durable coatings to improve conveyor belt energy efficiency.



Researchers to Develop Solid Lubricant Coatings for Conveyor Systems

May 04, 2022



A research and development team led by Min Zou, professor of mechanical engineering and an Arkansas Research Alliance Fellow, has received a \$550,000 grant from the National

Foundation to develop low-friction, graphite-lubricant coatings for conveyor systems.

Conveyors comprise about a quarter of the trillion global conveyor market, which has increased significantly in recent years because of e-commerce. However, an enormous amount of energy is wasted in these systems. High

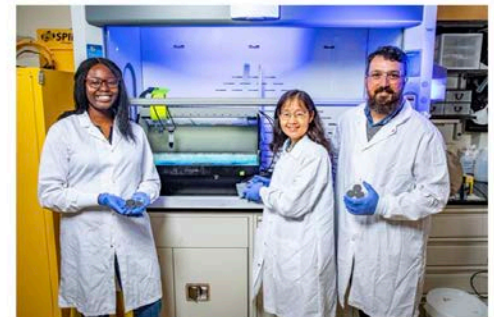


Photo by University Relations

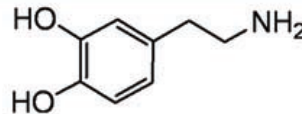
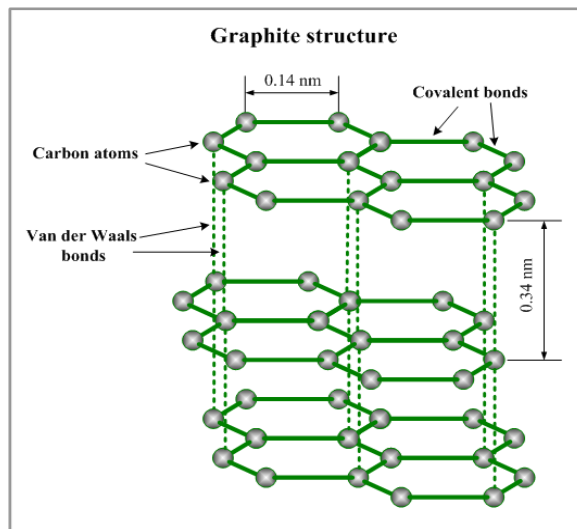
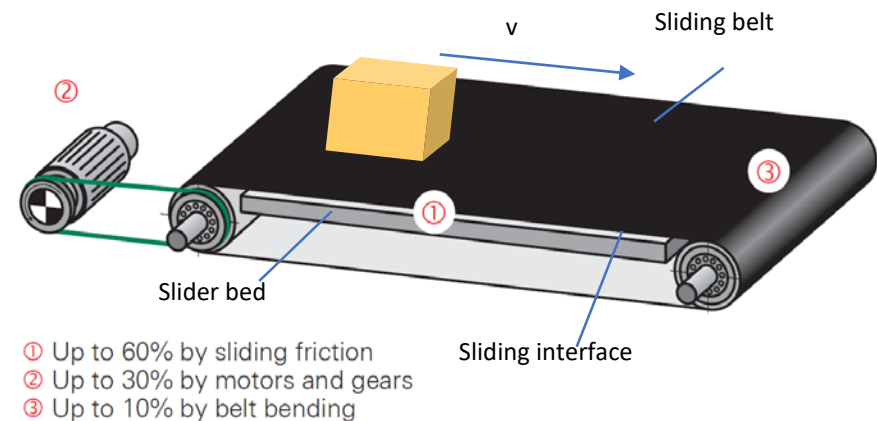
Doctoral student Adedoyin Abe, at left, Min Zou and Josh Goss, senior research assistant.

Goal: Reduce Friction Losses in Conveyor Systems

Frictional energy losses are estimated to account for 1.4% of the global GDP (Holmberg & Erdemir, 2017)

- 20% of total global energy consumption is associated with overcoming friction

In conveyor systems, up to 60% of the motor power consumption is used to overcome friction



Dopamine: bioinspired building block for surface coatings

Solution: A patented low-friction graphite coating utilizing a bio-mimetic adhesion promoter

Value Proposition: UPS WorldPort

- Largest of 5 UPS hubs
- 33,255 conveyor motors running 155 miles of conveyor line
- \$69.2 million in annual electrical usage



Potential Economic Impact:

$\mu = 0.4 \rightarrow \mu = 0.3$: \$10.4 million in savings

$\mu = 0.4 \rightarrow \mu = 0.1$: \$31.2 million in savings

What if this was extended to the entire UPS distribution network?

A Model for Multi-University/Industry Collaboration

2 Arkansas Universities

Largest Conveyor Manufacturer in the US



- Cutting-edge materials science research and development
- Experience in tech entrepreneurship and industrial scale-up
- Together, utilizing these competencies to address an issue faced by a major Arkansas-based industry

Thank you!

Robert “Drew” Fleming

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