FROM LAB TO MARKET

Q&A WITH DR. TANSEL KARABACAK, CHAIR OF THE DEPARTMENT OF PHYSICS AND ASTRONOMY, UA LITTLE ROCK

By AMP Staff

For Dr. Tansel Karabacak, 2017 Arkansas Research Alliance Fellow and member of the ARA Academy, physics began as an "intellectual adventure." When his doctoral advisor inspired him to connect fundamental science to applications, he realized he had found his true calling.

From his lab at the University of Arkansas at Little Rock, Karabacak focuses his research on the synthesis of nanomaterials and their applications in energy, the environment and human health. His team's latest innovations have sparked collaborations with major companies around the globe.

Dr. Tansel Karabacak

AMP: Your work is rich with commercial opportunities. What challenges must researchers overcome to bring research to market?

Dr. Karabacak: In my opinion, one fundamental challenge is the scarcity of communication between industry and academia. As a scientist, I would like to listen to people from industry and learn more about the challenges they are facing. Similarly, industry does not seem to be aware of great technological opportunities developed in universities. In other words, *academia and companies need to talk more.*

Another challenge is navigating the bumpy road of transitioning exciting technology to the commercial market. University researchers are not always equipped with proper expertise in commercialization or simply do not have enough time among their other responsibilities in the university such as teaching and mentoring students. It would help a lot if we had more startup companies in Arkansas, especially in Central Arkansas, as local startups tend to engage more with academic researchers.

It would also be valuable to have a streamlined process of interfacing between academia and entrepreneurs with a clear focus on communicating with university researchers, understanding the technology, identifying opportunities to reduce technical risk and leading the way towards commercialization.

AMP: With an assist from an ARA Impact Grant, you and your team have developed a process that has caught the interest of some major industrial powerhouses. What can you share?

Dr. Karabacak: We developed a new surface-engineering method, which we named "hot water treatment," to introduce a nanostructured layer on a metallic material by simply immersing the metal in hot water or exposing it to steam. The method is extremely simple, does not require any chemical additives and is therefore environmentally friendly. This novel approach is applicable to most of the elemental metals and their alloys, is low-cost and is scalable to industrial processing.

In our ARA Impact Grant project, we investigated the antimicrobial applications of nanostructured surfaces developed by hot water treatment. We focused our studies on aluminum, copper and zinc due to their wide use in applications that involve exposure to bacteria. For example, we demonstrated that aluminum foil becomes highly antibacterial after a hot water treatment less than a minute at 750C (1670F), killing more than 95 percent of the bacteria. This has received the attention of an aluminum foil company and led to the start of a collaborative project, which is currently in its early stages.

AMP: Why are companies interested in hot water treatment?

Dr. Karabacak: There are several potential applications of hot water treatment that we're currently investigating, and we're already in communication with several companies. A few of these applications include antimicrobial surfaces (e.g. for medical implants, food packaging and HVAC systems), water treatment and supercapacitors. However, there are many other potential applications that we would like to investigate such as medical devices, hospital furniture, batteries, solar cells and fuel cells.

AMP: How do you and your team move forward with commercialization?

Dr. Karabacak: We have a few pending patents that are expected to receive the attention of companies for licensing opportunities. We also have submitted a few grant proposals for product development toward commercialization with a start-up company in Arkansas. We plan to continue these efforts in transferring our technology to commercial applications.

AMP: This is terrific insight to how research becomes a viable commercial solution. Parting thoughts?

Dr. Karabacak: I would like everyone to know that we develop novel materials that are relevant to Arkansas' economy and that research is an integral part of education at UA Little Rock. We care about applications of our research as much as we care about the new fundamental knowledge it generates. We are looking forward to learning more about the needs of our local industry and aligning our research accordingly. Let's start a dialogue and build something meaningful together.

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