Alfred University researchers work with WNY companies on thermoelectric devices
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Alfred University (AU) is working with TAM Ceramics of Niagara Falls and ENrG Inc. of Buffalo to develop ceramic oxide thermoelectric devices (TEG) that could lead to more fuel-efficient cars. Since these thermoelectric devices convert waste heat to usable electricity, using ceramic oxides will enable these devices to work at much higher temperatures, said Doreen Edwards, professor of materials science and dean of Inamori School of Engineering at AU. Recipient of a $200,000 New York State Energy Research and Development Authority grant to improve the TEG's performance, TAM is developing the ceramic powder while ENrG is incorporating the materials into ceramic sheets. AU will be characterizing and sintering the powders TAM develops, using a process called spark plasma sintering. Edwards will oversee the characterization, using equipment in the Center for High Temperature Characterization, which will allow researchers to measure properties of the materials as temperatures up to 1,000-degrees Celsius. Olivia Graeve, an AU engineering professor, will oversee the spark plasma sintering of the powders."In the combustion of fossil fuels in an automobile, as much as to 75 percent of the fuel energy used is squandered as waste heat," said Edwards. Creating thermoelectric devices that can operate at high temperatures could improve the fuel efficiency of cars, trucks and other motorized vehicles.Thermoelectric devices convert electricity from waste heat. Not only does the process involve the direct conversion of heat to electricity, but the reverse is also true: electricity into heat. It also can be used to force rapid cooling, according to Edwards.TAM Ceramics and AU professors are developing high temperature ceramic materials, with an eye toward expanding the applications in which thermoelectric devices may be used. To date, most commercial devices have used inter-metallic semi-conductors, said Edwards. "These inter-metallic materials] can only be operated at lower temperatures in air," said Edwards, "and are often made of expensive or toxic materials, such as lead tellurides." Ceramic oxides, on the other hand, may be developed to function well at high temperatures in air as well as in highly corrosive environments, she said.The Center for Advanced Ceramic Technology (CACT) will also be contributing $6,000 to the project, bringing the total value of the project at AU to $37,000. Funded by the New York State Division of Science, Technology and Innovation (NYSTAR), the CACT's function is to facilitate academic-industrial research partnerships