Science

# Dr Michael Akindeju draws closer to achieving nanotechnology goals

By Malvika Hemanth
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Federation University mechanical engineer lecturer, Dr Apurv Kumar and MKPro Group director and principal consulting process chemical engineer, Dr Michael Akindeju are working together to transform Ballarat into a nanoparticle powerhouse with projects working on water purification and space travel. Picture by Lachlan Bence.

One Ballarat man has continued to strive towards his goal of transforming the region into a nanotechnology powerhouse, having already established key partnerships with institutions here and abroad.

Since spruiking the lofty idea in November last year, Dr Michael Akindeju, who is the director and principal consulting process chemical engineer at Lucas-based engineering firm, MKPro Group, has formed pivotal bonds with Federation University, Victoria University, Australian National University as well as the Indian Institute Of Technology in Chennai.

These relationships, which Dr Akindeju was able to develop less than month after speaking to *The Courier* about his plans and finalsing them in December 2022, has allowed the enterprising academic to focus on several projects including those tackling the nation's water crisis along with the exciting field of space exploration.

Federation University mechanical engineer lecturer Dr Apurv Kumar, is one of the three professionals working alongside Dr Akindeju from the Ballarat-based tertiary centre.

He said having Dr Akindeju's expertise would be a "game-changer" for the region's science sector particularly through the creation of graphene and activated carbon nanoparticles from used car tyres.



"Nanoparticles are those chemicals that can be put into anything and it will alter the properties significantly which will allow us to engineer and design new materials," Dr Kumar said.

"So having Michael onboard has really helped us innovate a lot."

## TURNING WASTEWATER INTO DRINKING WATER

He said one of the initiatives they were working on was in the sphere of water purification.

"So we've been able to extract carbon from waste tyres and then Michael has been able to produce nanocarbons from there which we

Kumar said.

"He's been able to produce these (nanoparticles) very economically, which will be very beneficial to their commercial scaling into the future."

The method the groups propose to employ to bring such innovation to light is through a thermal chemical process called pyrolysis.

"Pyrolysis is a process of breaking down rubber under high temperature in a controlled way to recover carbon black, oil, and steel from waste tyres," Dr Akindeju said.

"That carbon black is what we are using to create the graphene and carbon nanoparticles."

Dr Akindeju said if he is able to successfully mass create graphene and carbon nanoparticles at a viable cost, it would aid immeasurably in increasing the region's accessibility to clean water.

"It would mean that we would be able to source safe, drinking water from the sea, or the ocean and the cost would be significantly reduced which would see residents and the government reaping the benefits," he said.

**INNOVATING SPACECRAFT**

Other technologies Dr Akindeju is spearheading, in collaboration with Federation University and the Indian Institute Of Technology in Chennai, is the production of titanium oxide sub-nanoparticles.

"We are looking at seeing if we can achieve very high heat transfer characteristics of a fluid using nanoparticles that Michael is producing," Dr Kumar said.

"So we are trying to see if we can get very close to very high thermal conductivity and if we can achieve that, then it will simplify a lot of our complex systems."



safety of occupants in spacecraft.

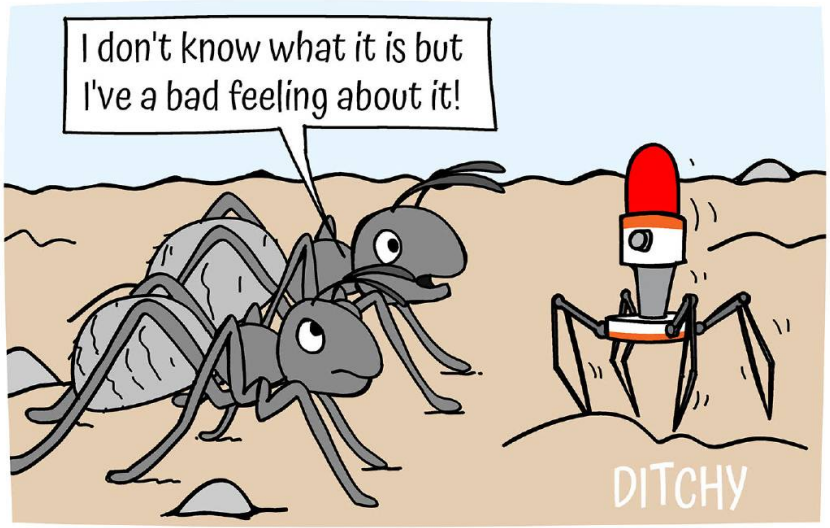
"It's heat transfer fluid that we are trying to engineer, which will effectively cool down the spacecraft, especially when astronauts re-enter (Earth) when they are taking off because currently, the technology that they use is quite expensive and it's not safe," he said.

"We have seen accidents happening and astronauts losing their lives so having a better heat transfer characteristic will ensure that those spacecrafts are cooled significantly lower than what we are doing right now."

Dr Akindeju said such nanoparticles could also play an integral role in propelling Australian aircraft and potentially personnel to the planet Mars, a feat which is become increasingly competitive across the world.

"Mars, travelling to the moon, are becoming places of interest. One limitation to all this is transportation and the number of people we can transport and that has an impact on the size of the spacecraft," he said.

"Now if we are able to cool the spacecraft quicker, it will mean we will be able to create lighter vessels that will enable us to transfer more people and things to Mars, which will eventually make it a place for man to live."



## BALLARAT'S NANOPARTICLE HUB INCHES CLOSER TO REALITY

While Dr Akindeju is currently in the pilot and validating phases in pioneering such nanotechnology, he is determined to have commercial operations in place as early as next year.

"The objective locally, here in Ballarat, is by the end of 2024, to have the capacity to produce two construction lines where we can undo particles that are solids and particles that are liquid," he said.

"This would allow us to produce about a ton of nanoparticles a day."

Dr Akindeju said however, his future goals were to create eight construction lines for a range of nanoparticles by the end of 2025.

He said these lines could be dedicated to producing nanoparticles with a variety of applications such as health, medicine and renewable energy.

As for his original plan of making the region a nanoparticle capital, he has already garnered the support of Dr Kumar who said the idea is a real possibility.

nanoparticles that are also quite economical," Dr Kumar said.

"In Australia we import all of our nanoparticles, so having a company that is local, in a regional area, and one that is so cost effective, it will definitely disrupt the whole industry and will really make Australia more self sustaining in this field."

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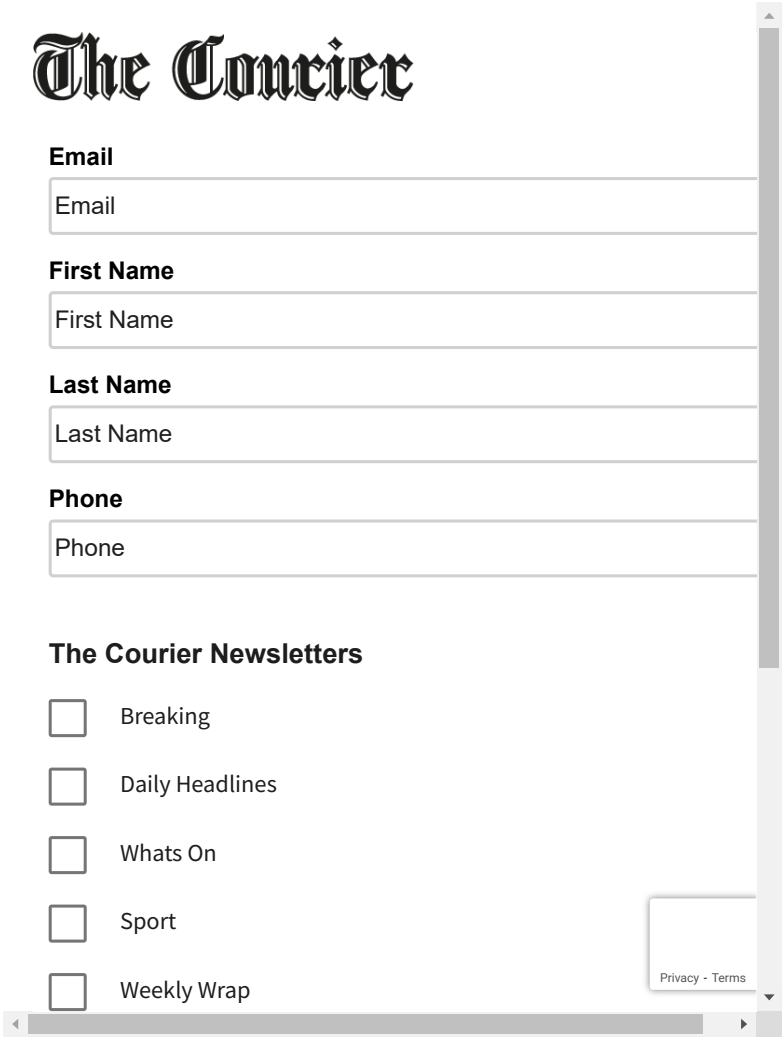

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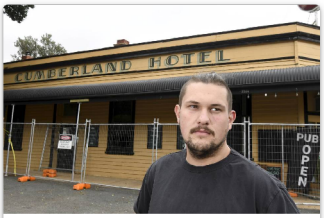


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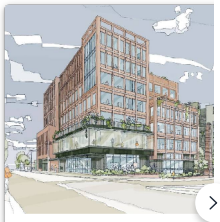

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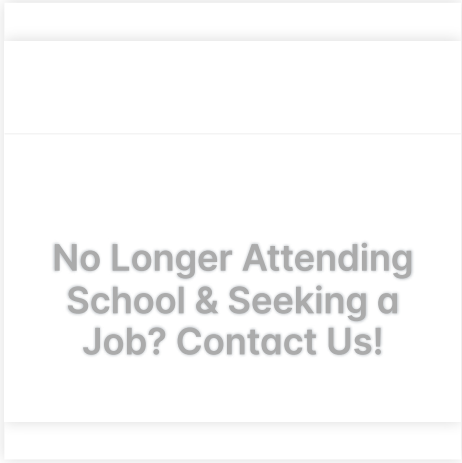


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