# Media Coverage

**Company:** VSPC
**Date:** 8 May 2011
**Publication:** ABC Radio Australia
**Page:** Online

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## Electric Cars Recharged Faster With Australian Technology

Desley Blanch

The future of electric cars revolutionised with Aussie nanoscale particles

DESLEY BLANCH : A Queensland nanotechnology manufacturer is promising to revolutionise the batteries used in electric cars with a new generation of nanoscale cathode materials.

The technological innovation will allow electric vehicles to be recharged in about the same time as it takes to fill a tank of petrol. Drivers will have an alternative to recharging overnight or swapping batteries on the road.

The Very Small Particle Company is commercialising nanoscale complex metal oxides using its patented manufacturing process. The Australian Government through its Green Car Innovation Fund has confirmed funding to the company to accelerate the final development of the electric car batteries.
Cars to be fully charged in four minutes sounds like a dream come true for the electric and hybrid car markets. I asked David MacInnes, CEO of the Very Small Particle Company what attention their technology is getting from the world's automotive industry and battery manufacturers.

DAVID MACINNES : We're getting a great deal of attention. We visited companies specialising in batteries and linking in with electric vehicles in Japan, China, Europe and North America and in total 23 different companies and we're actually supplying samples to a very high proportion of these to initiate the testing for use at high volume in these batteries.

DESLEY BLANCH : Well, the government funding is to enable you to commercially develop nanoscale lithium ion phosphate, that's LFP, for use in hybrid and electric cars. Now would you bring us up to speed on what LFP is and its role in improving battery performance?

DAVID MACINNES : The main feature of a battery is a chemistry associated with the cathode and the cost of the chemistry on the cathode is about 40 per cent of the battery, so a huge amount of effort looks at that chemistry.

We have a unique manufacturing process which can make the lithium ion phosphate particles very, very small and that gives absolutely enhanced properties for that technology.

Two key advantages: the first one is safety in that there's no danger of thermal runaway or explosion with lithium ion phosphate no matter fast you charge or discharge them, so safety is an absolute winner there and the other is the power performance. It means we can charge and discharge very quickly.

DESLEY BLANCH : How will you use the 1.09 million dollars funding to do what, that you've received from the government?

DAVID MACINNES : The challenge for us, we can already produce the material and it works extremely well, but we have to ensure that it's optimised for battery manufacturers and the battery manufacturers require the agglomerated particles to be customised to their process. So what we will do with the grant is optimise the primary particle size and the agglomerate particle size to fit in with existing processes, with the battery manufacturers.

DESLEY BLANCH : Well the integration of nanotechnology into batteries, is this a fairly active research area these days?

DAVID MACINNES : It's very active actually. We are in a unique position in that our manufacturing process can create complex metal oxides at nanoscale, so we're not just restricted to lithium ion phosphate although that is already getting into the market and is going to hold a very large market share in the next five years, but there will be new generations of material coming out and there's a huge amount of research going on into that, in particular, in North America and Europe and we are very well positioned to give enhanced properties to these new chemistries as they come along by manufacturing them at nanoscale and when they're at nanoscale the enhanced properties come about by the relatively large surface area for a given volume of material, so it allows the materials to react very quickly.

DESLEY BLANCH : So how does your system differ then from current rechargeable lithium ion batteries?

DAVID MACINNES : The main difference is the very small particle size. The primary particles are between 80 and 90 nanometres, although we can select the size that best suits a given application.

Because we have that very small size, it allows the chemistry to move very quickly, so basically the movement of lithium ions which is what creates the charge and discharge in the battery happens very, very quickly with very limited losses due to inefficient operation there, so our technology allows the lithium ion to move quickly and hence a very rapid charge and discharge.

DESLEY BLANCH : The Lithium Cobalt Oxide which is toxic and unstable at high temperatures is what they've been using isn't it? And yours is okay at high temperatures.

DAVID MACINNES : That's correct, we've had batteries manufactured with our material and tested it and not just high temperatures, but very low temperatures as well.

The other key test that is necessary is to look at what happens when a battery is discharged very rapidly. It's quite a crude test in that a nail is actually driven through the fully-charged battery.

With ours, you don't notice anything happening. With several other chemistries, it actually explodes. It's a very, very nasty explosion. You can imagine if there's a rear end collision.

DESLEY BLANCH : A car accident.

DAVID MACINNES : A car accident, yes. It's quite nasty.

DESLEY BLANCH : Well, you're now at the commercialisation stage with this new process which produces these nanometre sized grains of metal oxides. Are they cheaper to produce?

DAVID MACINNES : You have to look at the overall lifetime performance. We can cycle our material, that is charge and discharge it -- more than 7,000 times, that's way ahead of any competing materials. Now if you take the actual lifetime of a battery.

Now, let's assume that you charge your car every day so, say, 300 times a year and then you're at 7,000, you're into quite a few years in there and I can't do the maths quickly, but you're talking about ten to 15 years life cycle in these batteries. If you look at that total life cycle, the costs are very, very cheap for lithium ion phosphate, as well as all the environmental and safety benefits as well.

DESLEY BLANCH : I was just coming to the environment. What are the figures there for its environmental impact?

DAVID MACINNES : There are two aspects to that, first of all, the materials used in the manufacturing process. The majority of them are naturally occurring materials, such as lithium carbonate and iron and phosphate again.

They're all used in many, many other applications. So from this sort of material, it's very, very sustainable. The other aspect that was the final product, the LFP can be recycled very easily and there are no toxic side effects, even if it does get into the environment.

The other advantage, of course is in use, where an electric vehicle, you're actually reducing well from a sustainability point of view, you're not using any fuel in 100 per cent of electric vehicle, so that's a huge advantage from a sustainability point of view and in terms of greenhouse gas emission, you're cutting that down dramatically, up to 90 per cent and your source of electricity is used to charge these batteries.

DESLEY BLANCH : Well, you're focusing on batteries for hybrid electric vehicles first up. So what's your plan for getting LFP batteries into electric cars?

DAVID MACINNES : We're actively working with battery manufacturers worldwide and these battery manufacturers link into the major motor manufacturers and now most of the manufacturers are creating both hybrids and there's several varieties of hybrids as I'm sure you're aware, right up to the full battery electric vehicles.

The main market segment for full battery vehicles are actually in utility vehicles, in particular, buses, garbage trucks, etc., especially in China where whole cities which have populations the same as Australia are basically being dictated to and told that they will switch over to 100 per cent electric utility vehicles, garbage trucks plus buses as soon as possible. So we're contributing to all these applications.

DESLEY BLANCH : Well, you're also able to scale the technology to consumer products and things like what power tools, laptops, is that the direction?

DAVID MACINNES : The process we have can be scaled up to very high volumes very easily and that's quite unique in terms of this chemistry and that allows us to ensure that we have the capacity to meet the demand as these market segments grow. The electric vehicle segment is the one that is growing dramatically by about 18 billion dollars by 2020 are the figures we have, so it's a huge market.

But within the total market, you'll find that power tools, laptops and mobile phones are also going to expand quite dramatically and the advantage of being able to fully charge your mobile phone in two or three minutes, that's something people will pay for.

DESLEY BLANCH : So when's it all getting to market, have you got a date?

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DAVID MACINNES : Well in many ways, we're already in market. We can produce small batches of material and it's already out there being tested and the testing process is quite a prolonged active process can take sometimes two years with these major manufacturers. Now that's already started.

The scale up will happen in less than two years time. The equipment that we use in the manufacturing process is readily available used in pharmaceuticals and food production industries so it's available off the shelf, so the main constraint is lead time on that equipment, but the equipment is already there and standard. So, less than two years is the answer to your question.

DESLEY BLANCH : And tell us about the development of the actual technology, how it was done here in Australia.

DAVID MACINNES : Basically it comes down to the key scientists who invented the technology about six, seven years ago. They realised that there were major drawbacks with other production processes in terms of trying to make the particles very small. In particular the energy required to make these small particles where you use a grinding process, for example, just go up exponentially as the size goes now.

So they came up with a process where you're starting basically with chemical atoms, so it's a bottom-up process, so you actually build the particles at the molecular level and build them up and that process is - well, One, it is unique, but it can be used for any complex metal oxide, not just LFP.

So not only do we have a good process for LFP and today's generation of batteries, but we're future proofed as well. We've got a process which will stand the test of time and contribute to technologies that are maybe five, ten years out.

DESLEY BLANCH: David MacInnes is CEO of the Very Small Particle Company as he explained how their company is improving the rechargeable battery with a new generation of nano-scale cathode materials developed by Australian scientists.