

## The use of platinum group metal nanoparticles in wastes from roadside verges for the production of high-value catalysts

*"The results from this collaboration have enabled us to develop techniques and gain experience which will help towards the development of alternative plant-based remediation practices for sweeper wastes." Yorwaste Ltd*



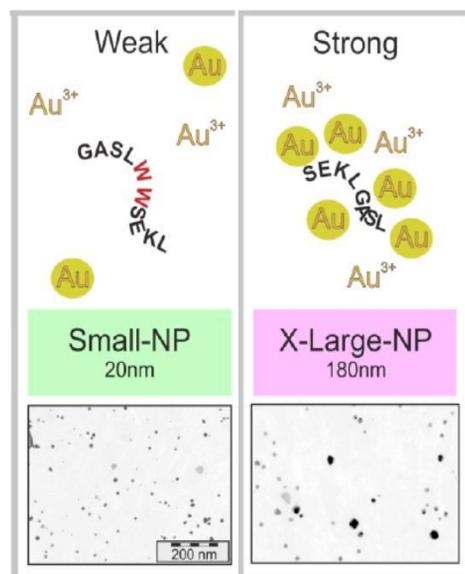
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**OUTCOMES:** We have achieved our objectives to investigate nanoparticle formation using synthetic peptides and analyse catalytic activity in the subsequently pyrolysed nanoparticle-containing plant biomass. Our promising results demonstrate that the expression of synthetic peptides in plants can be used to alter nanoparticle size and subsequent catalytic activity in plants. As part of our third objective, to determine if plants could be used to selectively take up platinum group metals from sweeper wastes, we have shown that sweeper wastes contain detectable levels of valuable metals. However, our studies show that further work is needed to understand the phytotoxicity behind these wastes so that they can be optimised to allow plant growth. Our wider studies indicate that synthetic biology could be used to develop plants that can selectively take up platinum group metals from metal-rich wastes.



Peptide sequences control the size of nanoparticles (NP)

**INITIAL AIMS:** Platinum group metals are rare elements that are particularly used in catalytic converters on road traffic vehicles. Over time, palladium and other valuable metals are lost via exhaust fumes and deposited onto roads and verges. Waste collected from road sweepers contains detectable levels of palladium. Plants can take up platinum group metals as nanoparticles in their tissues. With the ultimate goal of recycling these rare metals, the aims of this project were to:

1. Investigate if the expression of synthetic peptides in plants can control nanoparticle size
2. Analyse catalytic activity in plant biomass that contains pyrolysed nanoparticles
3. Determine if plants can be used to selectively take up platinum group metals from sweeper wastes

- Results from this project are being investigated further as part of funding from the New Zealand Ministry of Business, Innovation and Employment Global Strategic Partnership