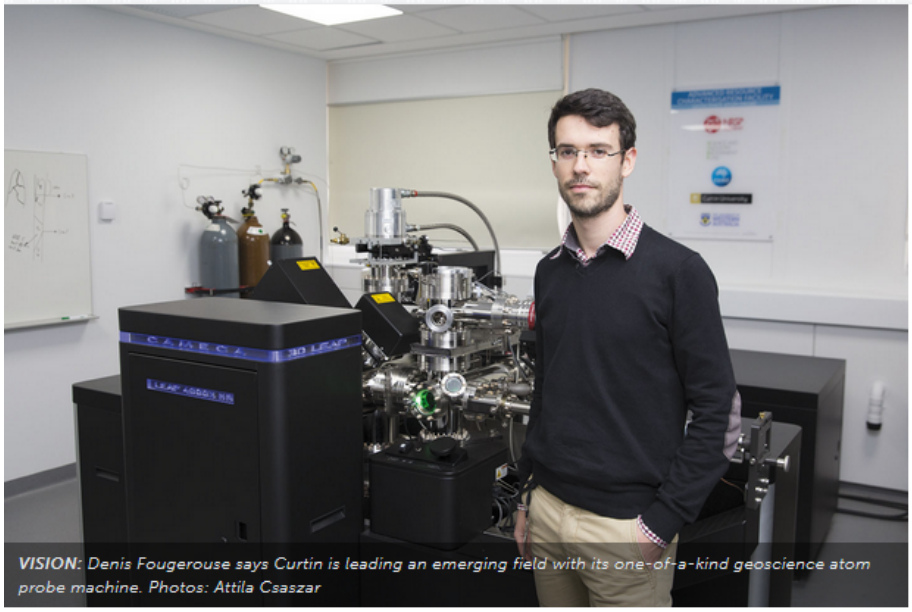

VISION: Denis Fougerouse says Curtin is leading an emerging field with its one-of-a-kind geoscience atom probe machine. Photos: Attila Csaszar

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Probes draw curtain on 'locked' gold

Katie McDonald | Tuesday, 27 September, 2016 - 11:23

A team of researchers in WA are leading an emerging geoscience field that could influence the future of gold recovery.

Researchers at CurtinUniversity [7] are painstakingly working on a process of locating large resources of metallic gold nanoparticles 'locked' in gold-bearing mineral deposits, which may have ramifications for the industry worldwide. CurtinUniversity [7] School of Mines research associate [8]DenisFougerouse [8] and his team are at the forefront of a pilot study testing the capabilities of a new Geoscience Atom Probe machine.

The ability to find tiny 'invisible' gold in refractory ores has the potential to improve mineral processing, according to Dr Fougerouse.

"It's a bit early to talk to the miners and industry," Dr Fougerouse told *Business News*. "We need to do some leg work first to show how this can help their operations; once we can prove the concept then it will be great to work with the mining industry."

The machine was commissioned at Curtin in July last year and Dr Fougerouse said the team was currently focused on and testing the instrument's capabilities and on collaborations with other universities.

"If we can show the benefits of the technology we think atom probe analysis could be implemented routinely in the industry during feasibility studies," he said.The researchers are currently looking at how the machine can provide information on the distribution of atoms and what the findings mean to science, with an end goal of using the research to assist metallurgists and miners.

Dr Fougerouse said the machine had been used to examine arsenopyrite, otherwise known as 'fool's gold', a common refractory mineral that can contain traces of locked gold.

“Arsenopyrite is a mineral found in Australia and other mines across the world,” he said. “This mineral can be confused with gold, and although not every arsenopyrite contains gold, it is common to find gold locked inside this mineral.

“And that’s what we have studied using the Geoscience Atom Probe.”

Using a focus ion beam-scanning electron microscope, also installed at Curtin, Dr Fougerouse and his team performed ‘nano surgery’ on the mineral to extract small samples 1,000 times smaller than the width of human hair, to shape into fine needles for the atom probe analysis.

“Typically the amount of material analysed is really small – a single grain of salt is over a billion times larger,” Dr Fougerouse said. The Geoscience Atom Probe machine can identify information of the position and type of individual atoms by the rate the gold atoms contained in the mineral evaporate, which is then 3D-imaged on a computer.

Dr Fougerouse said results from the study had shown that gold could be either hosted as nanoparticles or as individual atoms in different parts of the crystal structure.

“Our research shows the Geoscience Atom Probe has potential to characterise gold deposition processes at the atomic level,” he said.

“Knowing how the gold is distributed within these minerals could make a difference – this could help unlock ‘hidden’ gold resources in known deposits and enhance gold recovery.”

Dr Fougerouse said the discovery of new giant and world-class mineral deposits was quite rare, and that there was a need for mineral exploration to find more deposits. By understanding the distribution of gold within the mineral, Dr Fougerouse said it had potential to aid metallurgy and mineral exploration and improve mineral processing.He said it could also provide the opportunity to mine deposits not previously considered, including for economic reasons. “In the future we hope this information will help better extract gold,” Dr Fougerouse said.

“Although we are in the early days of atom probe microscopy in geoscience … our final aim is to optimise mineral processing and work with metallurgists.”

The study has received funding support from the Science and Innovation Endowment fund and forms part of the National Resource Science Precinct’s Advanced Resource Characterisation facility – a joint project between CSIRO [9], Curtin and the UniversityofWesternAustralia [10].

“Atom probe microscopy is defining a new field in geoscience and Curtin has placed itself at the leading edge of it,” Dr Fougerouse said. “It’s exciting to do something for the first time in science.”

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