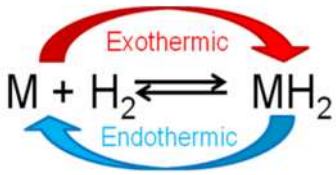
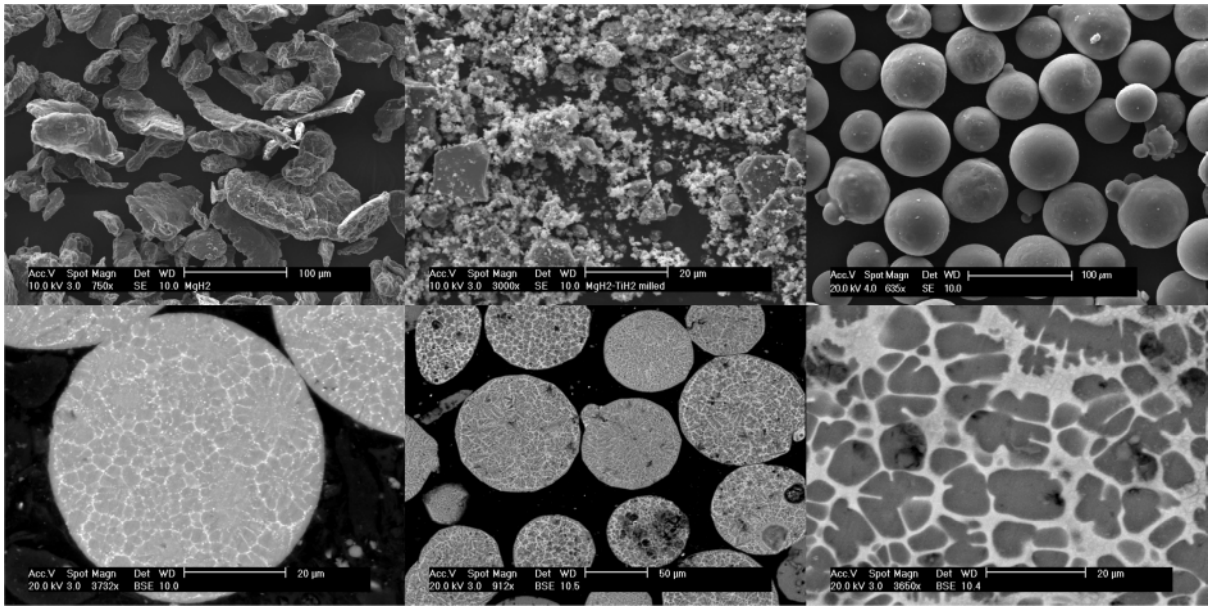
Advanced Materials Research Group
project summary

Project Title	Materials research centred on the fabrication, characterisation and testing of novel magnesium (Mg) based hydrides for concentrated solar power (CSP) applications.
Researcher	Andy Patman
Project Summary	At suitable temperatures, materials such as these undergo a phase transformation which results in a release of the hydrogen stored within them, in this case leaving Mg metal. During this process, the applied heat is absorbed into the material and effectively stored. At a later time, exposing the Mg to hydrogen gas at a sufficient pressure causes the reverse reaction to occur, reforming the original hydride and releasing the heat that had been stored. In the case of CSP, excess heat, generated during periods of intense sunlight and low electricity demand, may be reversibly stored within such a hydride for use during later periods when demand is greater or the intensity of the sunlight is less. Through the creation of new alloys of Mg, processing them into different forms, and by generating tailored microstructures within them (see image below), the heat absorbing/liberating reaction with hydrogen can be made faster and more efficient. This research is also uncovering methods of fabrication which allow the amount of hydrogen taken up by Mg to increase to its theoretical maximum, thus permitting the greatest possible quantity of energy to be stored; a capacity that is not often achieved in practical situations.




Acc.V Spot Magn Det WD 100 µm
10.0 kV 3.0 750x SE 10.0 MgH2
Acc.V Spot Magn Det WD 20 µm
10.0 kV 3.0 3000x SE 10.0 MgH2-TiH2 milled
Acc.V Spot Magn Det WD 100 µm
20.0 kV 4.0 635x SE 10.0
Acc.V Spot Magn Det WD 20 µm
20.0 kV 3.0 3732x BSE 10.0
Acc.V Spot Magn Det WD 50 µm
20.0 kV 3.0 912x BSE 10.5
Acc.V Spot Magn Det WD 20 µm
20.0 kV 3.0 3650x BSE 10.4