

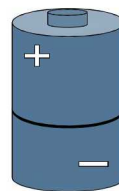


Exploration of Metal Hydrides via Auger Spectroscopy and Thermal Desorption Spectroscopy

Andrew Jalbert

What are metal hydrides and why do we care?

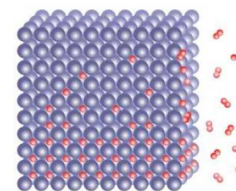
Metal hydrides are metals bonded to hydrogen. Hydrogen is small enough to be stored between metal atoms. If it can be inserted and withdrawn, then it can be used as a fuel source, for example in ecofriendly cars.



Li-ion Battery



Compressed H₂ 200 bar

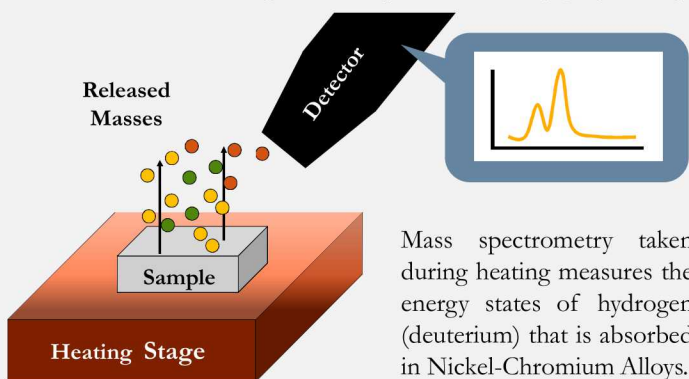


MgH₂

Hydrogen Capacity	4 wt%	7.7 wt%
Energy Density	0.2 kWh/kg	3 kWh/kg
	0.5 kWh/L	4 kWh/L

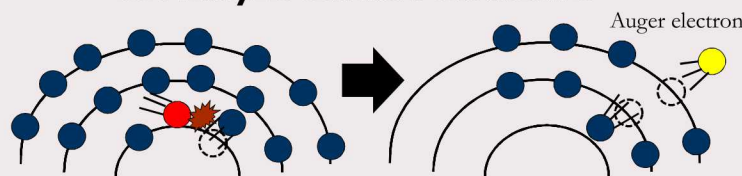
Goal: Ideally, hydrogen enters and leaves a metal based storage material easily. We hope to improve these mechanisms by better understanding how surface structure affects them through the use of thermal desorption spectroscopy and auger spectroscopy.

Thermal Desorption Spectroscopy (TDS)



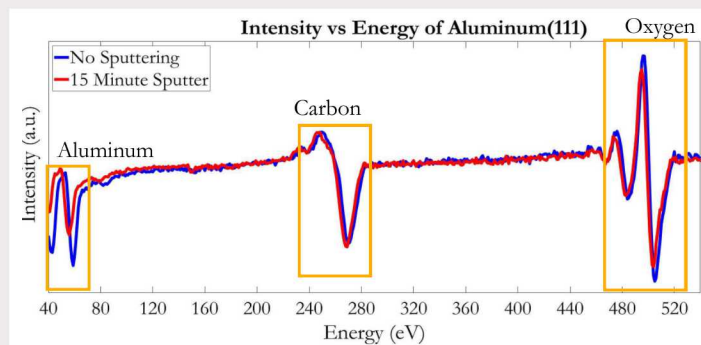
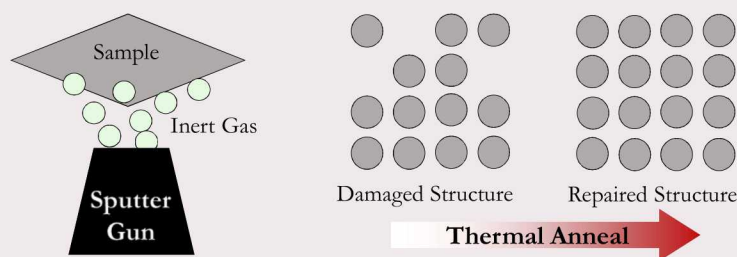
Mass spectrometry taken during heating measures the energy states of hydrogen (deuterium) that is absorbed in Nickel-Chromium Alloys.

Auger Electron Spectroscopy (AES) to Analyze Surface Structure



When electrons are ejected from a material, their energies are signature to the chemical species present and their bonding states.

Control of Surface Structure via Sputter/Anneal Cycles



Conclusion: AES provides a nanoscale view of surface structure impact on hydrogen diffusion. TDS provides a macroscopic perspective of how this then impacts hydrogen storage in the metal. Together, both methods will help improve hydrogen storage materials.

