

## Synthesis and characterization of novel hydrides

Miriam Peña-Álvarez<sup>1\*</sup>, Jack Binns<sup>2</sup>, Andreas Hermann<sup>1</sup>, Mary-Ellen Donnelly,<sup>2</sup> Liam Kellsall<sup>1</sup>,  
Philip Dalladay-Simpson<sup>2</sup>, Ross T. Howie<sup>2</sup>  
Eugene Gregoryanz<sup>1,2</sup>

<sup>1</sup>Centre for Science at Extreme Conditions and School of Physics and Astronomy, University of Edinburgh, Edinburgh EH9 3JZ, United Kingdom

<sup>2</sup>Center for High Pressure Science Technology Advanced Research, Shanghai, People's Republic of China

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\*e-mail: mpenaal@ed.ac.uk

Dense metallic hydrogen is predicted to exhibit a number of exotic properties including high-temperature  $T_c$  conventional superconductivity and superfluidity [1,2,3,4]. However, these properties are expected to emerge at pressures and temperatures which are currently beyond the capabilities of current static-compression experiments [5,6]. As such, research efforts have been shifted towards hydrogen-bearing compounds as a possible route to achieve these exotic states [7]. From the experimental point of view, high pressure, in combination with high-temperature, can facilitate compounds to adopt stoichiometries that would not be accessible at atmospheric conditions. Consequently, in the last years there have been great advancements in this field. [8, 9,10,11,12]

This work aims to show our recent experimental efforts in synthesising binary hydrides combining Diamond Anvil Cell with high laser heating as synthetic tool towards. As diagnostic, together with X ray diffraction are used. Moreover, special attention will be paid to hydrogen and hydrogen rich materials formed as primary or secondary products through the combination of high pressure and temperature.

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