Contract No:

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Disclaimer:

MAX phase materials and MXenes as hydrogen barrier coatings

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Introduction

- Most structural alloys used in neutron environments display high diffusivities of hydrogen and its isotopes.
- Permeation barriers are a key supporting technology for both next generation fusion reactors and the national security enterprise
- Previous research suggests that most barrier materials which perform well in laboratory experiments fail when placed in radiation environments.

Methods

MAX phase materials

- A class of layered carbides and nitrides
- currently being investigated for fission applications
- excellent stability under neutron irradiation

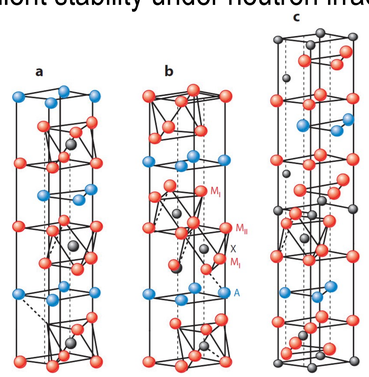

Figure 1 MAX phase unit cells: (a) 211, (b) 312, and (c) 413 phases.[1]

Acknowledgement

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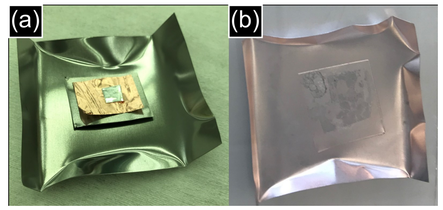
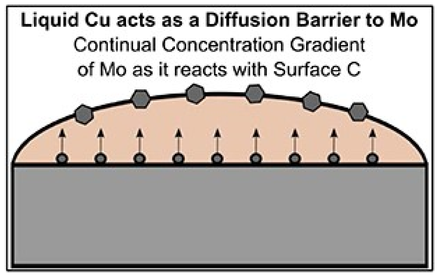
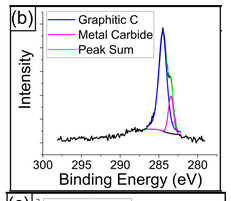
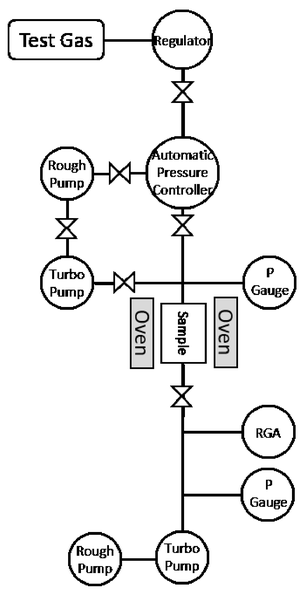
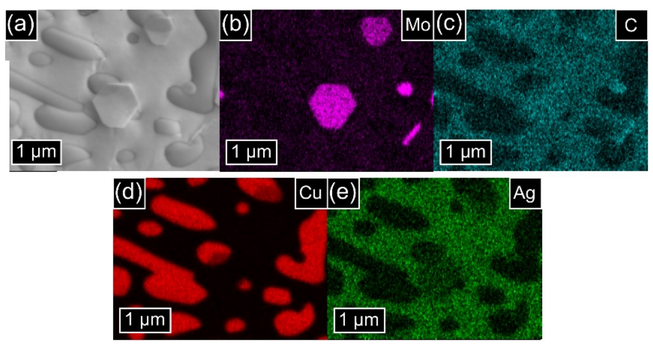
Develop **hydrogen isotope permeation barriers** suitable for **neutron irradiation** environments based on **MAX phase materials.**

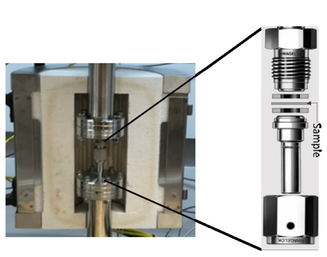












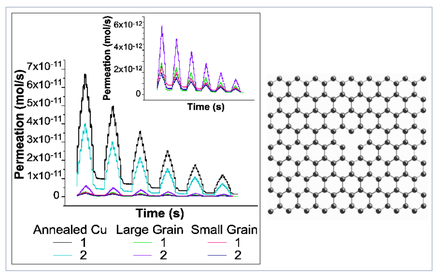


Figure 3 a)Raw permeation data measured on Cu and graphene coated Cu and b) C vacancy in a graphene lattice

Find out more about this research.

Results

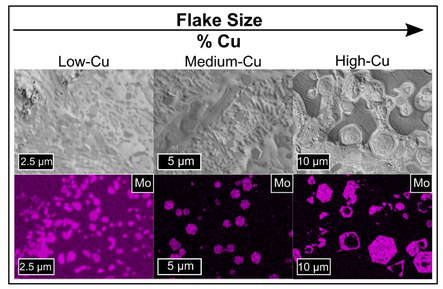


Figure 2: SEM images and EDS maps comparing the Mo_2C flake sizes on Low-, Medium-, and High-Cu, Ag-Cu alloys grown at 1000 °C.

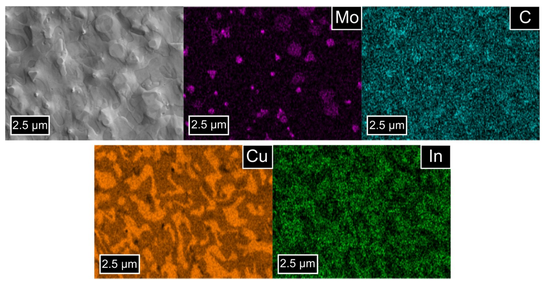


Figure 3: Mo_2C synthesis on an In-Cu alloy substrate at 800 °C.

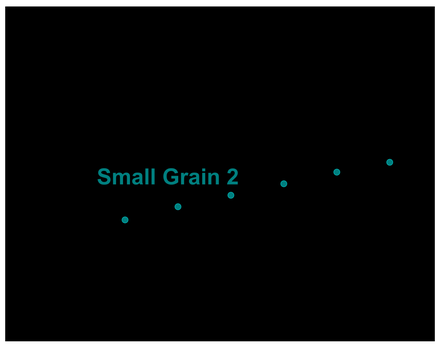


Figure 4: Comparison of the permeation data between the annealed Cu and graphene coated Cu. The PRF at 624 K is ~28