FLEET

ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

Liquid metal chemistry for the synthesis of functional 2D Materials

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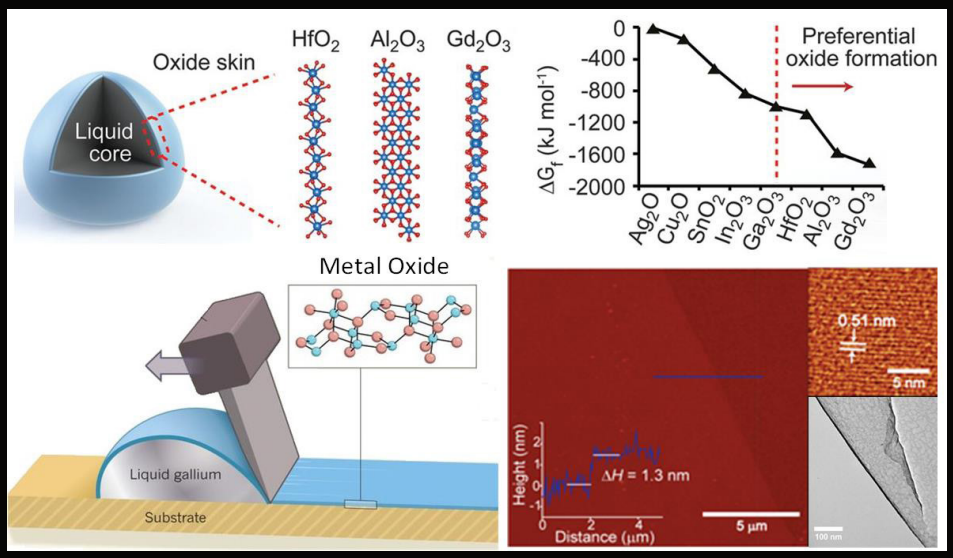
Abstract

Most metals feature an atomically-thin oxide layer at the metal air interface.[1] This also applies to liquid metals including molten tin, indium, gallium and their alloys. In many cases this oxide layer grows in a self-limiting reaction providing a pathway towards atomically-thin, two-dimensional materials.[2] This talk will discuss different liquid metal-based synthesis strategies for 2D materials and will highlight how large area ultrathin sheets can be isolated form the liquid metal interface. Interestingly, liquid metal-based synthesis strategies allow the isolation of atomically-thin nanosheets of non-stratified materials, providing an opportunity for drastically increasing the number of accessible 2D materials.[2] A variety of liquid metal derived materials will be discussed in this talk, including metal oxides,[2, 3] chalcogenides,[4] nitrides and phosphates.[4-7] The developed materials are ideally suited for a variety of applications including in electronics, piezotronics and catalysis.[5-7]



Overview of liquid metal synthesis approaches, AFM and TEM characterizations of isolated sheets and evaluation of their electronic properties.

BIO

Dr Torben Daeneke received his PhD in Chemistry from Monash University, Australia in 2012. After graduating he held postdoctoral appointments at the CSIRO and at RMIT University (Australia). In 2015 he received an RMIT Vice Chancellor's postdoctoral fellowship. In 2018 he joined RMIT's School of Engineering as a faculty member and is now a Senior Lecturer. He has authored over 65 peer-reviewed journal articles and has been awarded several awards, fellowships and grants, including an Australian Research Council (ARC) Discovery Project and an ARC Discovery Early Career Researcher Award (DECRA). His research interests span from the chemistry of liquid metals over the synthesis and functionalisation of 2D materials to materials for energy and electronic applications. In recent years he has developed novel techniques for the synthesis of 2D materials using liquid metal solvents, leading to publications in Science, Nature Communications and JACS, among others.

References

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