

How to deal with a reduced palette of elements: materials, methods and architectures.

Materials scientists face a challenge in designing new or improved materials and devices since some of the building blocks can no longer be freely used. These are the so called critical elements, which are elements which should be avoided or minimized in reason of their toxicity, limited availability, uneven spread, and economic impact.

The most conventional approach to reduce the utilization of critical elements or materials is by the design of alternative materials in which these elements are not present, or in a much lower amount. But it is also possible to make an impact on the amount of critical materials used by designing improved alternative deposition or fabrication methods and device architectures.

In my talk I will present an overview of the activities carried out at LMGP on new materials, methods and device architectures that are currently being developed and that can contribute to a lower use of critical materials. I will then focus on my past and current research on Cu based materials. Cu is an attractive element since it is abundant and non-toxic, and it has a high potential in optoelectronic devices. Several examples of deposition of Cu based oxides by atmospheric chemical approaches will be given and the application to optoelectronic devices with improved architectures will be illustrated.