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Department of Materials Science and Engineering

Metal Borides: From High-Tc Magnets to High-Current-Density Electrocatalysts

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Abstract: Boron reacts with most metals to form the large class of metal borides (MBs), ranging from the boron-richest YB_{66} soft X-ray monochromator up to the metal-richest $Nd_{14}Fe_2B$ permanent magnet. This huge composition range, coupled with the complex chemical bonding patterns in these materials, make this class of materials an ideal playground for unexpected discoveries. [1,2] In this seminar, I will present our approach to “designing” (a) novel magnetic MBs featuring low-dimensional magnetic subunits (Figure below, left) as well as (b) new electrocatalytic MBs (Figure below, right) featuring low-dimensional boron subunits. I will show that these highlighted subunits not only help build new MBs but they play prominent roles on the studied properties. [3,4] Furthermore, a new reaction was developed that enables the synthesis of these materials at the nanoscale, a major step toward fulfilling their huge potential. [5]

Bio: Boniface P. T. Fokwa obtained his BS and MS from University of Yaounde I (Cameroon), his PhD from Dresden University of Technology (Germany) in 2003 and his Habilitation from RWTH Aachen University (Germany) in 2010. After working as Heisenberg Associate Professor at RWTH he moved to the University of California, Riverside where he is currently a Full Professor. He was a visiting scientist at the University of Auckland (New Zealand, 2011), at Cornell University (USA, 2012) and a visiting Professor at the University of California, Los Angeles (USA, 2014-2015). He was awarded a Heisenberg Fellow (Germany) in 2011 and an NSF CAREER 2016. He serves as Section Editor for Encyclopedia of Inorganic and Bioinorganic Chemistry and as Chair of the ACS solid state chemistry subdivision. His research group combines experimental and computational methods to rationally design materials for energy-related applications such as magnets, superconductors and catalysts.

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