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Diamond-based Metal Composites

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High end applications as the beam collimators for the LHC or first wall materials in fusion reactors require not only innovative engineering of the assembly and the structural parts but require also unique property combinations of the materials they are made of, e.g. good electrical conductivity, high thermal conductivity, low absorption of elemental particles, low coefficient of thermal expansion (CTE), high stiffness, high strength etc.. Some of these requirements may even be mutually exclusive in monolithic materials.

A common strategy to cope with such unprecedented property combinations is to use a composite approach, which is essentially a structural solution on the micron scale. In this talk materials combining diamond particles and metallic matrices are presented that combine low CTE, high thermal and electrical conductivity, and high stiffness. A few fundamental issues concerning the potential and the limitations of these materials as well as possibilities to manufacture such materials and current challenges in the development will be discussed.

Primary author: WEBER, Ludger (EPFL)

Presenter: WEBER, Ludger (EPFL)

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