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Aluminium-Diamond: promising composites for thermal management in power electronics

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The need to reduce overheating failures in industrial power electronic has raise a challenge to materials scientist: the design of a material combining a high thermal conductivity and a coefficient of thermal expansion matching that of common semiconductors. This development can be more then ever considered as a key issue to cope with today's increasing power densities. Aluminium-Diamond represents in that respect one of the most promising materials currently under development.

In this work we will give a brief overview of the state of the art in Aluminium-Diamond Experimental thermo-physical properties (coefficient of thermal expansion, thermal conductivity) will be shown and some technological alternatives for their pre-industrial production will be demonstrated. Finally some limitations the role of the diamond conditioning and the interfacial reactivity will also be discussed.