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High-Temperature and Aerospace Coatings

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In high performance products, engineering coatings are often pushed to their mechanical, physical and/or chemical limits. For a wide spectrum of applications, tailored coatings made of metals, ceramics and polymers (and sometimes combinations thereof) are produced by various deposition techniques. The plenary talks will shed some light on recent developments in the field of high temperature and high performance coatings, some of which are being used in or designed for demanding aerospace applications. High-temperature resistant thermal barrier coatings (TBCs) produced by thermal spraying and/or EB-PVD are state of the art for both, industrial gas turbines and aeroengines. However, more recently the present authors have developed a new generation of TBCs and CMAS-resistant coatings using suspension spraying which demonstrate high performance at relatively reasonable cost. Moreover, thermodynamic modelling has proven beneficial for lifetime assessment of TBC bond coats. PVD Cr_2AlC MAX phase coatings were developed using magnetron sputtering and HPPMS, and were tested by the authors towards residual stresses, oxidation behavior and erosion resistance – a threat particularly posed to aeroengines. Also high entropy alloys were investigated as either metallic or nitride PVD coatings indicating great potential for high temperature applications combined with mechanical loads. Laser-arc deposited superhard ta-C coatings show a unique combination of high wear resistance and low friction coefficient, making them ideal candidates for sliding wear applications, not only in aerospace industry but also automotive industry where these coatings have matured to series products.

Keywords
thermal barrier coatings, high entropy alloys, ta-C coatings, MAX phase coatings, thermal spray, PVD, HPPMS, laser arc deposition