High temperature oxidation behavior of NiCoCrAlY coated CMSX-4 under hydrogen combustion relevant atmospheres

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Gas turbines are already a mature and indispensable component of the energy supply for load-flexible and reliable power supply, and this situation will be exacerbated by a further increase in fluctuating sources. In aviation, gas turbines are also indispensable in the long term due to their unrivalled power density for medium to long distances. In both areas, the use of hydrogen has gained enormous importance in recent years.

It is generally known that an increased concentration of water vapor due to hydrogen combustion changes the high-temperature oxidation behavior of the materials used in the hot section of the turbine. The main objective of the investigations was to evaluate the potential effects of additional water vapor on essential coated materials in the engine. The focus was on assessing the oxidation behavior and investigating the underlying mechanisms. Therefore, the oxidation behavior of NiCoCrAlY based coated CMSX-4 alloy was tested under various water vapor contents (air and 10m%) at different temperatures namely 1000°C/1150°C up to 1000h. Corresponding results on the oxidation kinetics, microstructure and phase evolution will be presented and discussed.

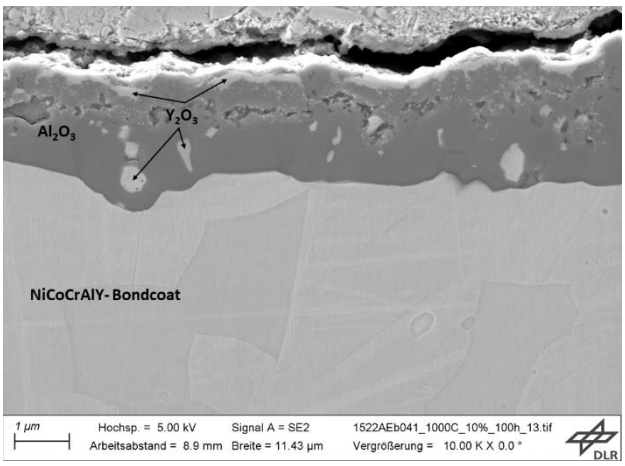

Figure 1. Cross section of water vapor tested material (CMSX-4 + NiCoCrAlY-Bondcoat) under 10m% for 100h at 1000°C

References

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