POD009

# Energy flux measurements on atmospheric pressure plasma spray torches with passive thermal probes

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Plasma spraying is an established coating process for the deposition of metallic and ceramic layers onto various substrate surfaces [1]. The control and optimisation of the whole process is of great interest in research and industry. Nevertheless, since the energy density in the plasma is much higher than in other experimental plasma sources the choice of diagnostics is very limited. The energy flux from the plasma to the surface is an important parameter to understand film growth and plasma surface interaction in general [2]. To measure the energy flux of plasma spray torches with and without the involvement of coating materials [3], efforts were made to adopt existing calorimetric probes. In order to withstand the harsh environment and temperatures, some changes of the probe design and evaluation were necessary and show promising results. The presented measurements showcase the applicability of a thermal probe for diagnostics of a plasma spray torch. Two different plasma spraying devices were investigated with regard to spatial resolution, input parameter as e.g. input energy and coating powders. The energy flux is among others dependent on the amount of impacting material, its temperature and degree of melting. When correlated with coating properties this method could provide a versatile control tool for the complex coating process. [1] Vardelle, A., et al. "A perspective on plasma spray technology." Plasma Chemistry and Plasma Processing 35.3 (2015): 491-509. [2] Gauter, S., et al. "Calorimetric investigations in a gas aggregation source." Journal of Applied Physics 124.7 (2018): 073301. [3] Kewitz, T., et al. "Investigation of a commercial atmospheric pressure plasma jet by a newly designed calorimetric probe." IEEE Transactions on Plasma Science 43.5 (2015): 1769-1773.

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