

Powder based metal additive manufacturing: feedstock powder and its effect on component properties

The powder as raw material, either for powder bed or blown powder technologies, constitutes an important strategy in metal additive manufacturing (AM). Powder surface chemistry plays an important role during AM processing and is initially determined by powder manufacturing method and alloy composition. This initial chemical composition is, however, not stable and progressively changes with time in dependence on powder handling procedures and especially processing by metal additive manufacturing. Presentation summarizes recent experimental observations and theoretical simulations of the changes in powder surface chemistry during the whole lifecycle of metal powder: from its manufacturing using different powder manufacturing technologies through powder handling and AM processing by variety of powder manufacturing methods. Results indicate significant enrichment in the thermodynamically stable surface oxides in case of high-alloyed powders during both, Electron Beam Melting (EBM) and Laser Powder Bed Fusion (LPBF). However, powder degradation processes differ significantly in dependence on AM technology/hardware and alloy composition. This powder degradation, however, has different effect on the defect formation during AM processing and is also depending on alloy system and AM technology.

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