Additive Manufacturing offers the chance to build parts which best fulfill process technology requirements through optimized geometries. High performance alloys with extreme chemical resistance can be brought into shapes which guide process media in the desired way, and which conduct heat so that an optimization of energy transport, momentum transport and mass transport can be fulfilled\(^1\).

To find the right shapes, the design loop can be individualized in a digital workflow:

**Parameterized model in CAD.** Geometries which are relevant to process conditions can be parameterized, so that according to a new set of numeric values, a new macroscopic 3D CAD geometry is automatically generated.

**Multi-physics simulation.** Simultaneous simulation of several fluids and the solid parts regarding mass and momentum transport, energy transport and resulting heat generates a digital twin of the real physics.

**Optimization.** The optimization of such complex nonlinear problems in acceptable time span makes it possible to find the best parameters for the CAD model in an iterative loop.

**Functionally structured digital material – multi-scale optimization**

This process of parameterized design allows even the rational positioning of functionally structured metal materials, so that the 3D part have different microfluidic properties in different areas of the part.

Such a digital shape optimization workflow further extends the potential for Additive Manufacturing methods, as tailor-made functionality can be automatically generated, which can be shown in impressing experiments of AM-made 3dprinted test bodies.