Abstract.

Embedded ink writing has been extensively applied in recent years for biomedical applications. Despite its outstanding capability of creating complex constructs, the challenge of optimizing diverse factors hampers the further utilization of this three-dimensional bioprinting strategy. In this work, we experimentally summarize the coupling effects of ink viscosity, support bath rheological properties, and key printing parameters on filament formation. Based on the gathered data, Bayesian optimization is used to establish a filament prediction platform, which accurately estimates the rheology of support bath for printing alginate-based ink under given conditions. Additionally, the optimal parameters for printing chitosan ink are predicted by the platform. Two representative eye-relevant tissues are successfully fabricated through the predictions of the platform. The insights lay the foundation for embedded ink writing strategies to guide the support bath design and select optimal printing parameters, aiming at the highly efficient reconstruction of human tissues and organs in the future.