Designing a microreactor for the parallel cell-free expression of multiple proteins

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In this study, we have explored the possibilities of bringing cell-free protein synthesis to lab-on-a-chip format. As an initial step, a relatively large chip with a single reactor was fabricated to evaluate the design issues that may arise during the miniaturization of such a system. Through the continuous exchange of the substrates and byproducts, we expected the developed system to address the issues of energy depletion and ribosome inactivation during cell-free protein synthesis in a miniaturized format. The performance of the fabricated microreactor was compared with the batch reactor system. Special emphasis is given to overcoming the problems of membrane clogging during the operation of the miniaturized CECF system. Examination of different methods for the fabrication of microreactors is in progress. We expect that the yield of protein synthesis will be further improved by implementing more efficient methods for the substrate-byproduct exchange.