Serially-ordered magnetization of nanoclusters via control of diverse transition metal dopants for the multi-sorting of cells in microfluidic magnetophoresis devices

강병훈, 한승민[1], 신무광, 장은지, 김현욱, 기지선, 손혜영[2],
허용민[2], 함승주†
연세대학교; [1]연세대학교 화공생명공학과; [2]연세의료원

A novel method (i.e., continuous magnetic cell separation in a microfluidic channel) is demonstrated to be capable of inducing multi-fractionation of mixed cell suspensions into multiple outlet fractions. Here, multi-component cell separation is performed with three different distinguishable magnetic nanoclusters (MnFe2O4, Fe3O4, and CoFe2O4), which are tagged on A431 cells. Due to their magnetization, which can be ideally altered by doping with magnetic atom compositions (Mn, Fe, and Co), the trajectories of cells with each magnetic nanocluster in a flow are shown to be distinct when dragged under the same external magnetic field; the rest of the magnetic characteristics of the nanoclusters are identically fixed. This proof of concept study, which utilizes the magnetic susceptibility-controlled nanoclusters (NCs), suggests that precise and effective multi-fractionation is achievable with high-throughput and systematic accuracy for dynamic cell separation.