Macromolecular Research (2023) 31:85–90
https://doi.org/10.1007/s13233-023-00131-y

Online ISSN 2092-7673
Print ISSN 1598-5032

COMMUNICATION

Non-specific protein removal and specific protein capture simultaneously using a hydrodynamic force induced under vortex flow

Hanzhe Liu[1] · **Dong June Ahn**[1,2]

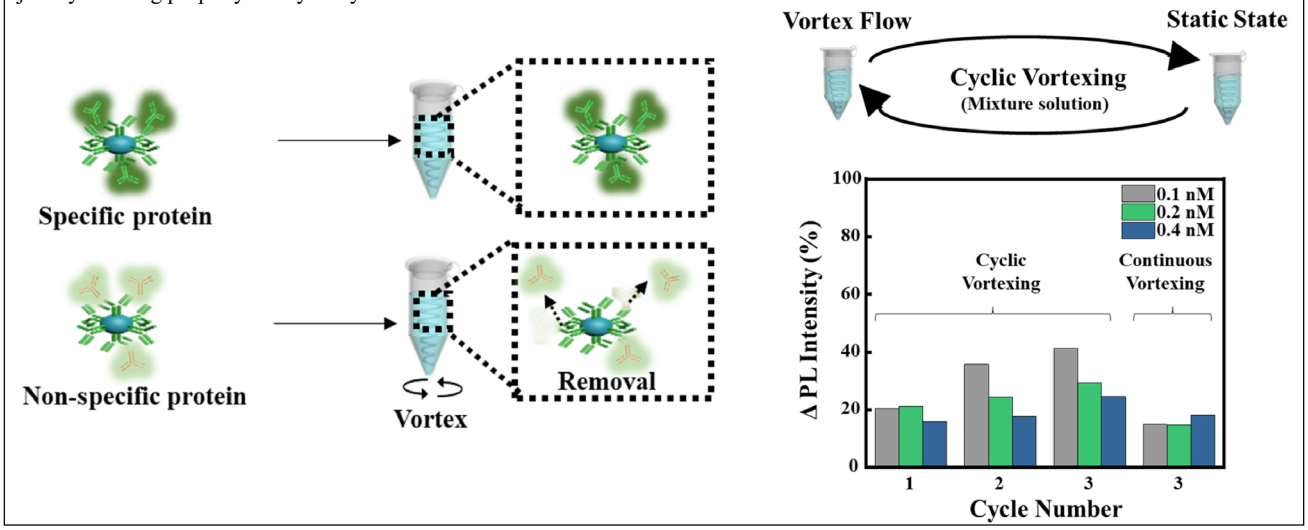
Received: 28 April 2022 / Revised: 8 September 2022 / Accepted: 9 October 2022 / Published online: 21 February 2023
© The Author(s), under exclusive licence to The Polymer Society of Korea 2023

Abstract

Non-specific binding (NSB) of proteins should be removed to increase the sensitivity of biosensors. In this study, cadmium selenide nanoparticles (CdSe NPs) were rotated in the solution by generating vortex flow, thereby achieved removal of two types of non-specific protein: (i) anti-mouse IgG-FITC (NSB) and (ii) bovine serum albumin (BSA)-FITC. By manipulating rotation rate from 0 to 1000 rpm, photoluminescence (PL) from each protein reduced up to 28% for anti-mouse IgG and 35% for BSA, respectively. In addition, capturing specific proteins from mixture solutions enhanced by 41% upon cyclic-mode vortexing, which is 2.7 times higher than conventional continuous vortexing. These results can open up a new feasibility for increasing sensitivity of biosensors just by utilizing properly the hydrodynamic force.

Graphical abstract

Hydrodynamic force is utilized under vortex flow for non-specific protein removal and specific protein capture. We make designs of cyclic vortexing mode. Capturing specific proteins from mixture solutions increases by 41% upon cyclic vortexing mode, which is 2.7 times higher than conventional continuous vortexing. The result may open up a new feasibility for increasing the sensitivity of biosensors just by utilizing properly the hydrodynamic force.



Keywords Non-specific protein removal · Protein capture · CdSe nanoparticles · Hydrodynamic force

✉ Dong June Ahn
ahn@korea.ac.kr

[1] Department of Chemical and Biological Engineering, Korea University, Seoul 02841, Korea

[2] KU-KIST Graduate School of Converging Science and Technology, Korea University, Seoul 02841, Korea