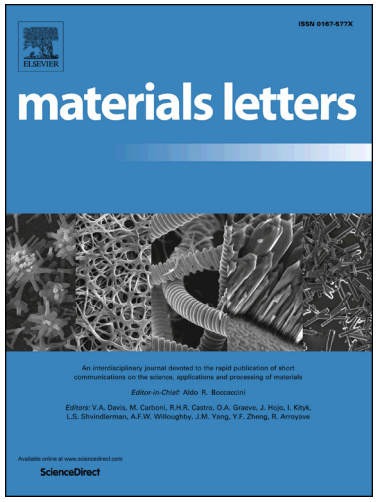

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A method of controlling the hole size of nanopores array on anodic aluminum oxide

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Highlights

- The hole size of the pores on AAO is shrunk down to 10 nm by shrinking nanopores.
- Various materials with preformed micro holes array can be used as substrates.
- This technique is convenient to conduct and cost-efficient.
- Simulations are done by ESI-CFD to explain the experiments and guide the experiments.

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Abstract: Solid-state nanopores are promising for applications in molecular biology and treatment of water pollution. Many techniques represented cannot fabricate nanopores array. In this work, we demonstrated a novel, cost–efficient and convenient technique to control the hole size of anodic aluminum oxide (AAO). It was based on the insufficient step coverage of plasma enhanced chemical vapor deposition (PECVD). Nanopores around 8 nm were obtained after depositing SiO_2 for 150 s. The distributions of the hole sizes were fitted with Gaussian function and mean sizes were extracted. The relation between hole size and deposition time was fitted. Generally, the hole size decreased linearly with the increasing deposition time. ESI–CFD was used to simulate this deposition process. The simulation agreed well with the experimental results. The result shows that this technique is promising for getting a large uniform nanopore array under 10 nm.

Keywords: nanopores array; PECVD; AAO; porous materials; simulation and modelling

1. Introduction

Nanopores have drawn a lot of attention these years because of their molecular biological use[1]. The solid-state nanopores are the most promising ones. Many techniques for the fabrication of solid-state nanopores, such as ion beam sculpting[2] and high energy electron beam[3], have been represented. Recently, two dimensional (2D)