Electronic Supplementary Information (ESI)

One Step Fabrication of Mesh-Reinforced Hierarchic Perforated Microporous Honeycomb Films With Tunable Filtering Property

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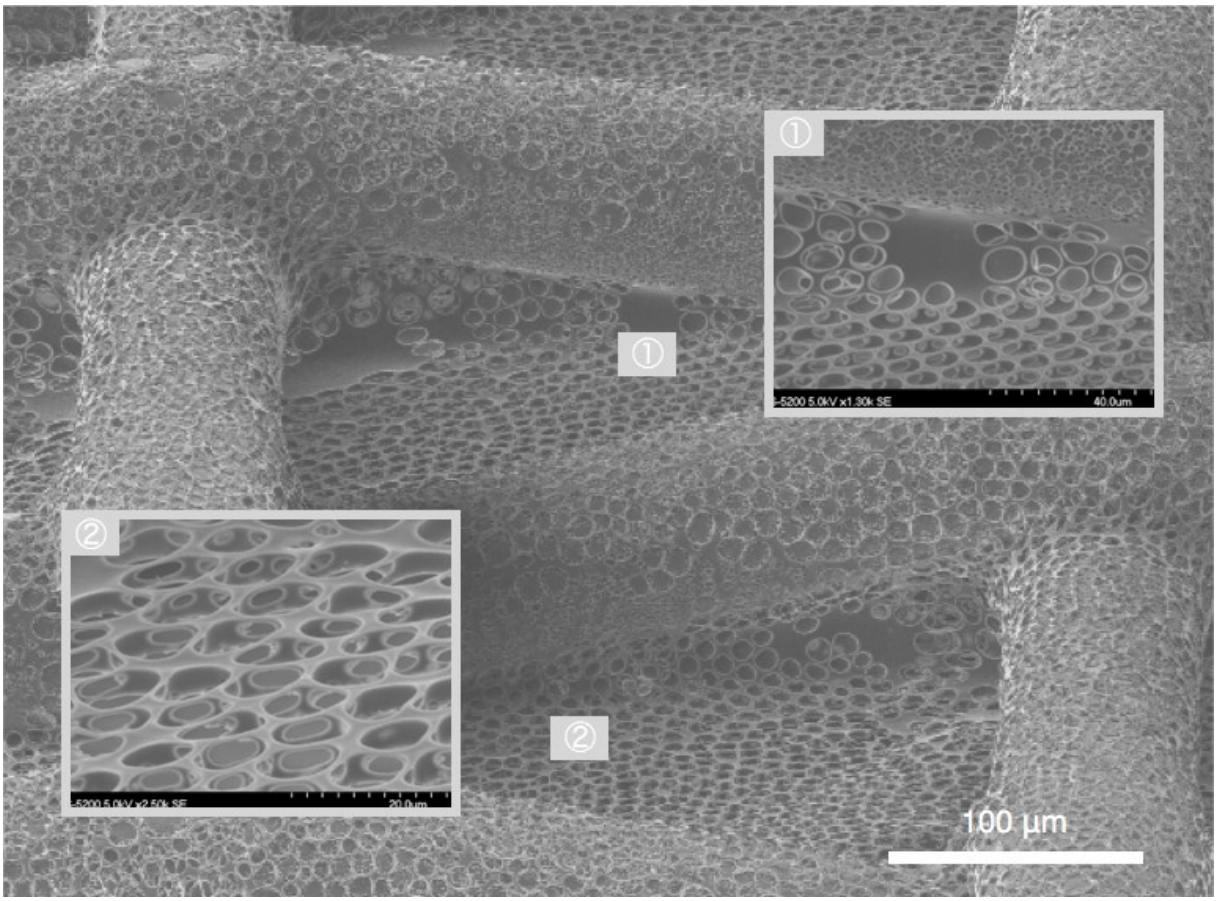

Figure S1. SEM image of tilted hierarchic perforated honeycomb film after stretching. Inset images show close up SEM images of respective parts.

Figure S2

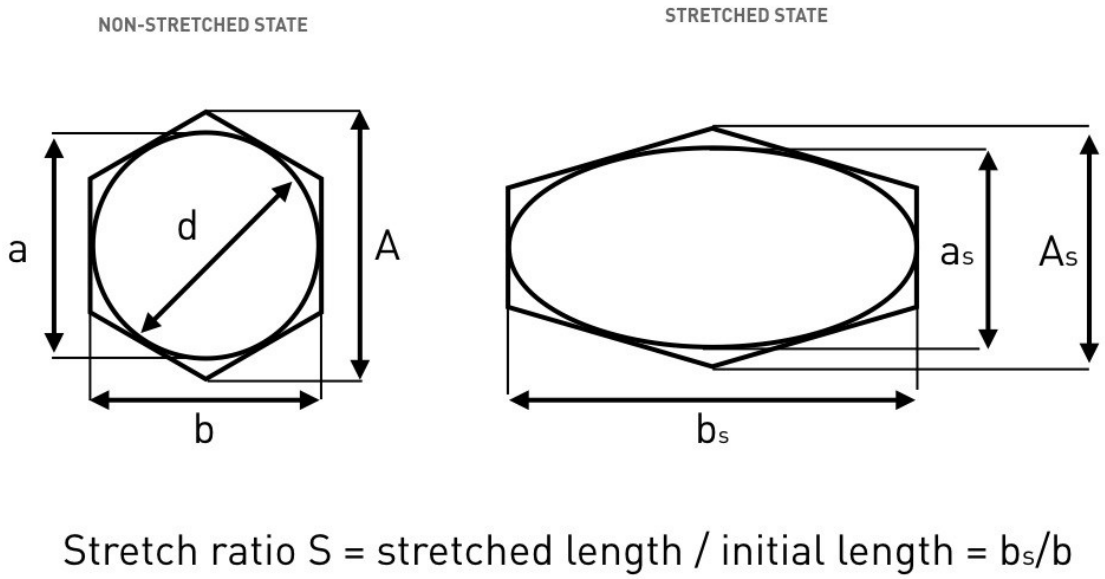

Figure S2. Schematic illustration of geometry of non-stretched (left) and stretched pores (right).

Since for the non-stretched state, b = d
b_s = S d … (1)

Since in the non-stretched, the honeycomb pore sits in perfect hexagon, A can be expressed as below.
A = 2d/√3 … (2)

The size of the honeycomb rim can be expressed as
A - d = d (2/√3 - 1) … (3)

By neglecting the minor morphology change in the honeycomb rim, the width of the pore in the stretched state can be expressed as
$a_s = A_s$ - (A - d) … (4)

From equation (3) and (4)
$a_s = A_s$ - d(2/√3 - 1)…(5)

A_s can be calculated in relation to the stretch ratio S and be expressed as below
A_s = d/√3 (2 √(1 - (√3/2 S2))+1) …(6)

From equation (5) and (6), the width of the obtained film is expressed as below
a_s = d/√3 (2 √(1 - (√3/2 S2))+1) - d(2/√3 - 1) …(7)

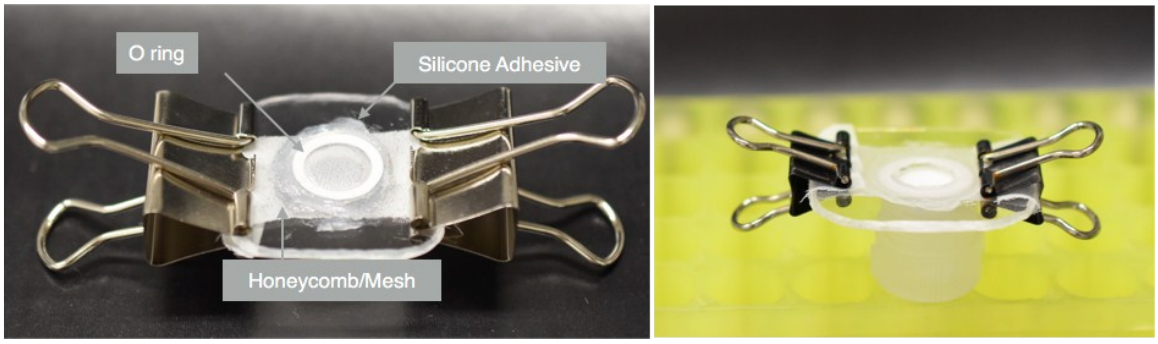

Figure S3. Photographs of how to fix stretched hierarchic perforated honeycomb films

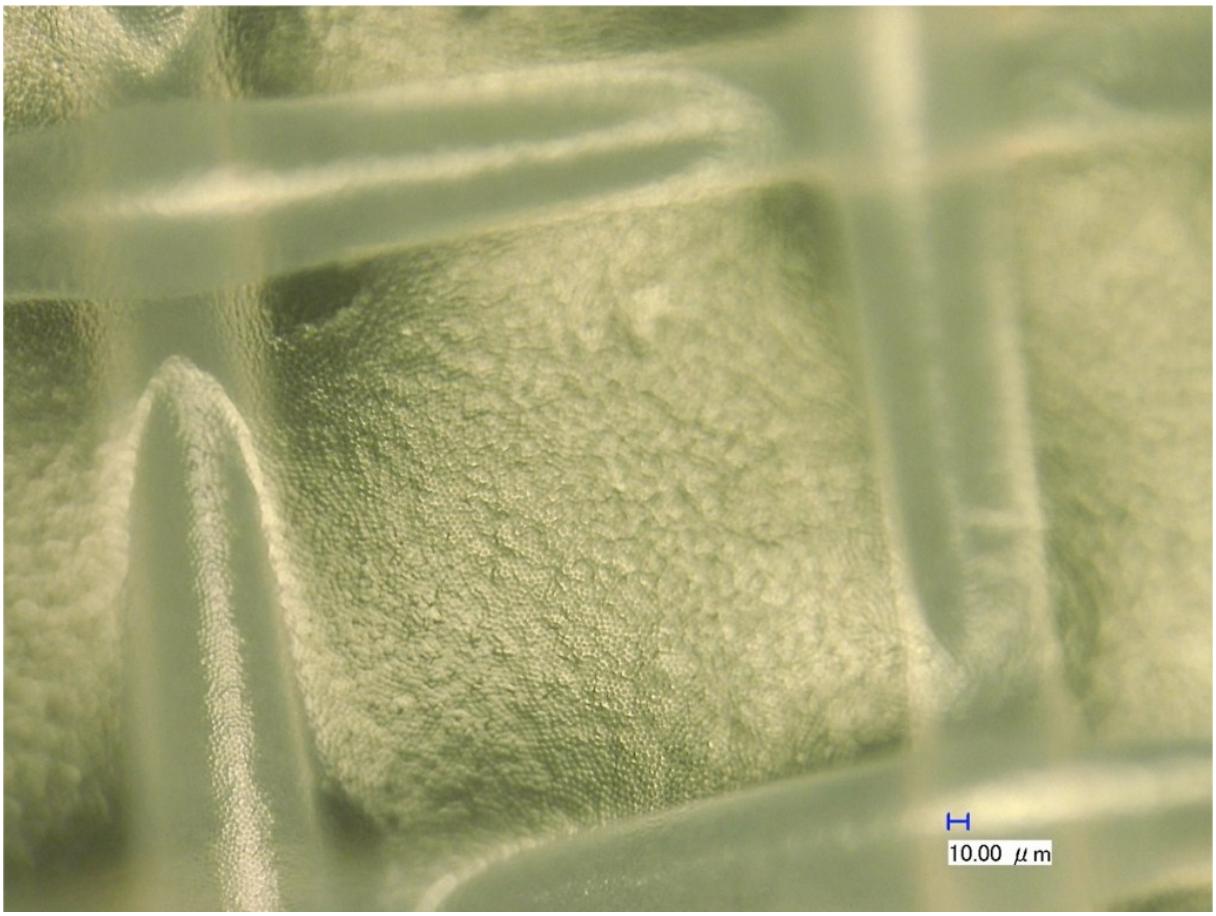

Figure S4. Optical micrograph of mesh-reinforced honeycomb film whose pore size was 2 µm. The film was prepared from 10 mg/mL solution.

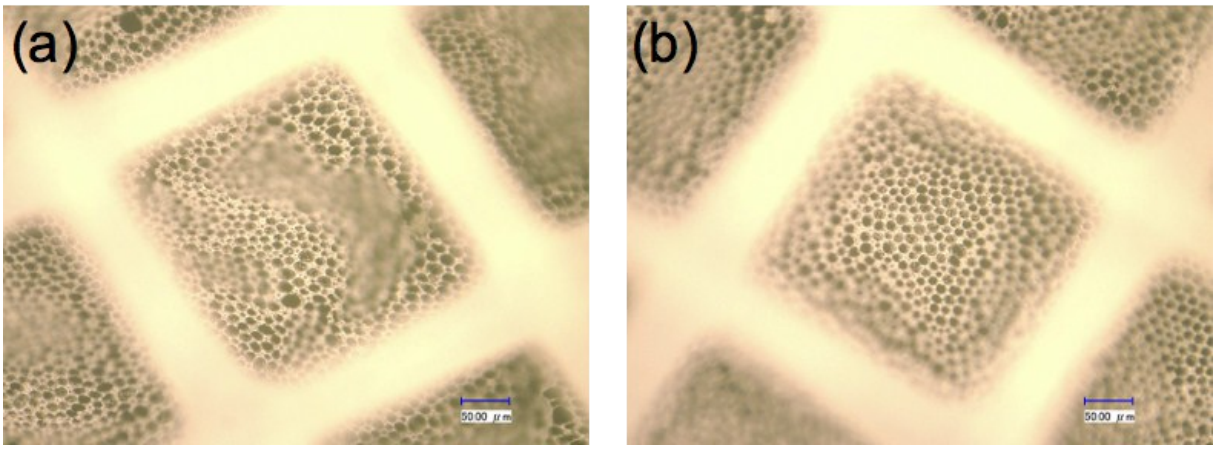

Figure S5. Optical micrographs of unstretched (a) and after 10 times stretching and relaxing cycles of perforated honeycomb meshes, respectively.

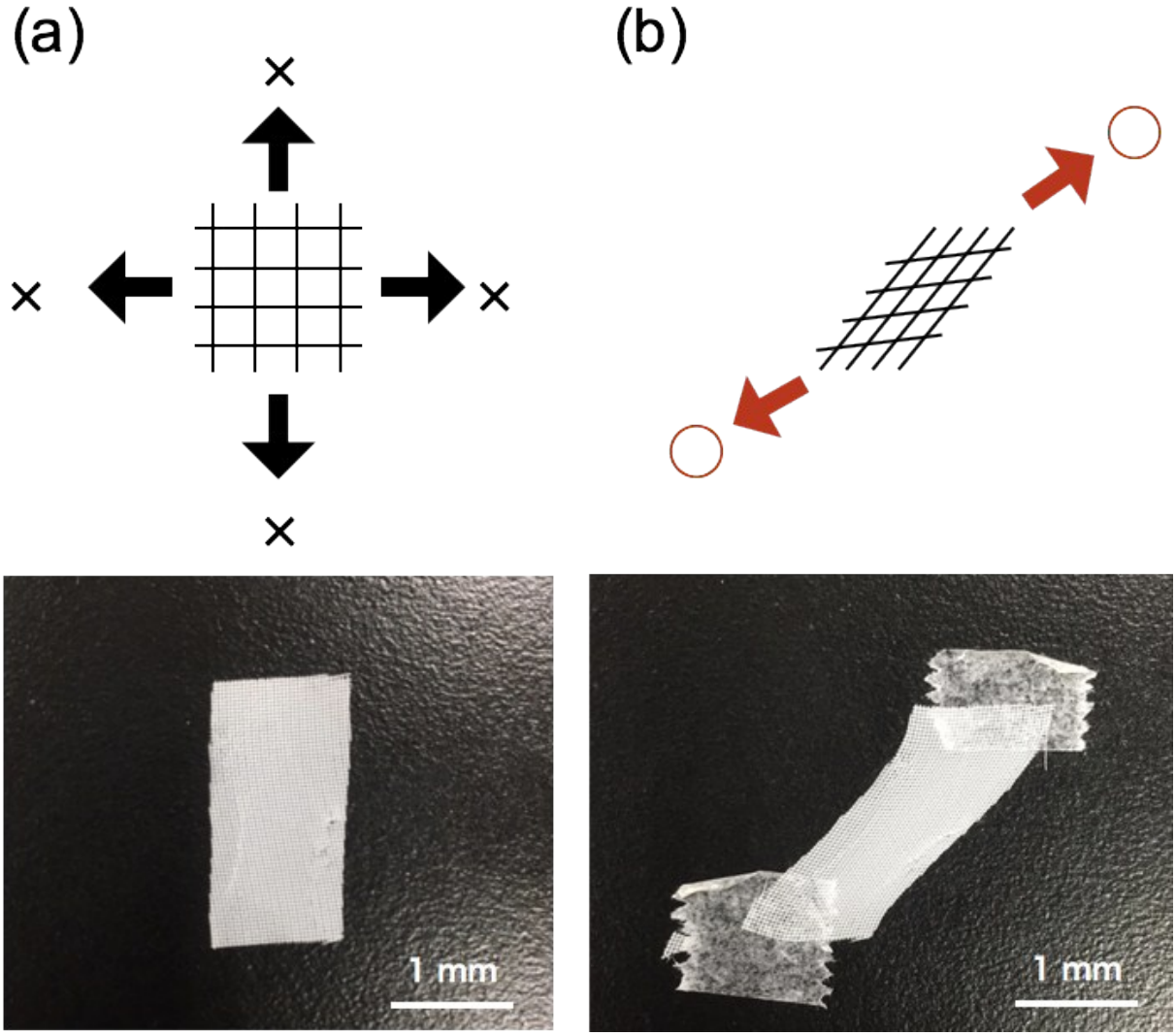

Figure S6. Models and photographs of unstretched (a) and stretched (b) perforated honeycomb meshes, respectively.