SUPPORTING INFORMATION

Genetically Encoded Conductive Protein Nanofibers Secretion by Engineered Cells

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Materials and Methods

1. Atomic Force Microscopy Images of the Peptides

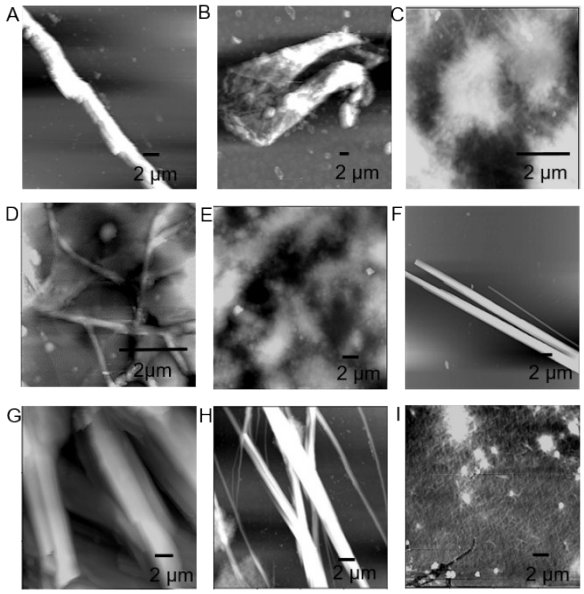

Figure S1. Atomic force microscopy (AFM) images of the designed peptides mica respectively: Amyloid like fiber (ALF) (A), ALF3W (B), ALF3Y (C), ALF3H (D), ALF3F (E), R5T (F), R5T3W (G), R5T3Y (H), and R5T3H (I).

2. Clonning of the CsgA Conductive Peptides

csgAW, csgAY, csgAWY and csgAYW gene fragments listed in Supplementary Table 1 were amplified from pZa-tetO-csgA-CmR (primers were listed in Supplementary Table 2). Recombinant genes were cloned into pZa-tetO-CmR through the cut ligate method using kpnI/mluI restriction sites and the plasmid constructs are represented in Figure S2, S4, S6, and S8 and sequence alignments of the constructs are shown in Figure S3, S5, S7, and S9.

Table 1- Gene sequences of the PCR Products

Gene Fragment	Sequence
CsgAW	GGTACCATGAAACTTTTAAAAGTAGCAGCAATTGCAGCAATCGTATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCA GTACGGCGGCGGCGGTAACCACGGTGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGG TGGCGGTAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATGGCGGCGGTAATG GTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACCCAACGTGGCTTCGGTAACAGCGCTACTCTTGAT CAGTGGAACGGCAAAAATTCTGAAATGACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCA TCTAACTCCTCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTGGTGGCGTAAATGGAA AGAATGGGATGACTGGTAAACGCGT
CsgAY	GGTACCATGAAACTTTTAAAAGTAGCAGCAATTGCAGCAATCGTATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCA GTACGGCGGCGGCGGTAACCACGGTGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGG TGGCGGTAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATGGCGGCGGTAATG GTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACCCAACGTGGCTTCGGTAACAGCGCTACTCTTGAT CAGTGGAACGGCAAAAATTCTGAAATGACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCA TCTAACTCCTCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTACTATCGCAAATACAAA GAGTATGATGACTACTAAACGCGT
CsgAWY	GGTACCATGAAACTTTTAAAAGTAGCAGCAATTGCAGCAATCGTATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCA GTACGGCGGCGGCGGTAACCACGGTGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGG TGGCGGTAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATGGCGGCGGTAATG GTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACCCAACGTGGCTTCGGTAACAGCGCTACTCTTGAT CAGTGGAACGGCAAAAATTCTGAAATGACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCA TCTAACTCCTCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTACTATCGCAAATACAAA GAGTACGATGATTGGTAAACGCGT
CsgAYW	GGTACCATGAAACTTTTAAAAGTAGCAGCAATTGCAGCAATCGTATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCA GTACGGCGGCGGCGGTAACCACGGTGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGG TGGCGGTAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATGGCGGCGGTAATG GTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACCCAACGTGGCTTCGGTAACAGCGCTACTCTTGAT CAGTGGAACGGCAAAAATTCTGAAATGACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCA TCTAACTCCTCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTACTATCGCAAATACAAA GAGTGGGATGATTATTAAACGCGT

Table 2- Primers that were used in this study

EK F-W	GGTACCATGAAACTTTTAAAAGTAGCAGCAATTGC	Forward primer for all the PCR reactions
EK R-csgA-W1	TTCTTTCCATTTACGCCACCAGTACTGATGAGCGGTCGC GTTGTTA	First PCR reaction to amplify csgA gene fragment from pZa-TetO-csgA-CmR and to add conductive domain sequences to 3 prime of gene fragment
EK R-csgA-W2	ACGCGTTTACCAGTCATCCCATTCTTTCCATTTACGCCAC CAGTACTGATG	Second PCR reaction to elongate conductive domain sequences to 3 prime of *csgA* gene fragment
EK R-csgA-Y1	CTCTTTGTATTTGCGATAGTAGTACTGATGAGCGGTCGC GTTGTTA	First PCR reaction to amplify csgA gene fragment from pZa-TetO-csgA-CmR and to add conductive domain sequences to 3 prime of gene fragment
EK R-csgA-Y2	ACGCGTTTAGTAGTCATCATACTCTTTGTATTTGCGATA GTAGTACTGATGAGCGG	Second PCR reaction to elongate conductive domain sequences to 3 prime of *csgA* gene fragment
EK R-csgA-WY1	CTCTTTGTATTTGCGATAGTAGTACTGATGAGCGGTCGC GTTGTTA	First PCR reaction to amplify csgA gene fragment from pZa-TetO-csgA-CmR and to add conductive domain sequences to 3 prime of gene fragment
EK- R-csgA-WY2	ACGCGTTTAATAATCATCCCACTCTTTGTATTTGCGATAG TAGTACTGATGAGCGG	Second PCR reaction to elongate conductive domain sequences to 3 prime of *csgA* gene fragment
EK R-csgA-YW1	CTCTTTGTATTTGCGATAGTAGTACTGATGAGCGGTCGC GTTGTTA	First PCR reaction to amplify csgA gene fragment from pZa-TetO-csgA-CmR and to add conductive domain sequences to 3 prime of gene fragment
EK R-csgA-YW2	ACGCGTTTACCAATCATCGTACTCTTTGTATTTGCGATA GTAGTACTGATGAGCGG	Second PCR reaction to elongate conductive domain sequences to 3 prime of *csgA* gene fragment

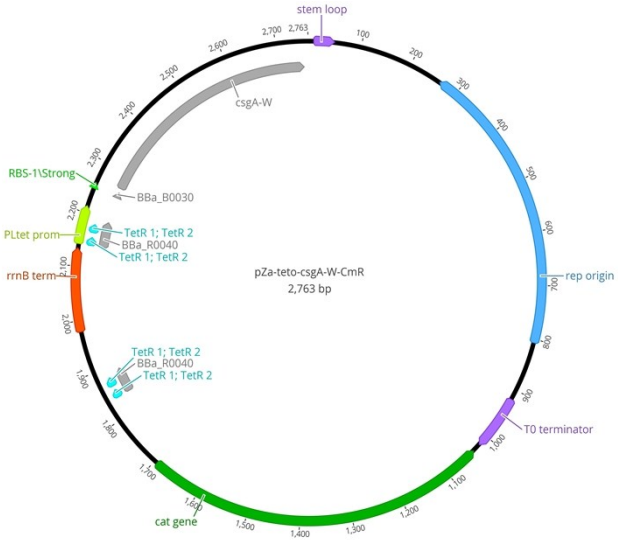

Figure S2 Schematic representation of the expression vector containing the *csgAW* gene fragment

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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TTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGGT
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGGT

GGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGGT
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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AACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCAT
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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GGCGGCGGTAATGGTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACC
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
GGCGGCGGTAATGGTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACC

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
CAACGTGGCTTCGGTAACAGCGCTACTCTTGATCAGTGGAACGGCAAAAATTCTGAAATG

ACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCATCTAACTCC
|||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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TCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTGGTGG
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTGGTGG

CGTAAATGGAAAGAATGGGATGACTGGTAAACGCGT  2763
||||||||||||||||||||||||||||||||||||
CGTAAATGGAAAGAATGGGATGACTGGTAAACGCGT  650
```

Figure S3 Sequence analysis of *csgAW* gene fragment. Upper DNA sequence is the reference and lower one is the cloned DNA sequence.

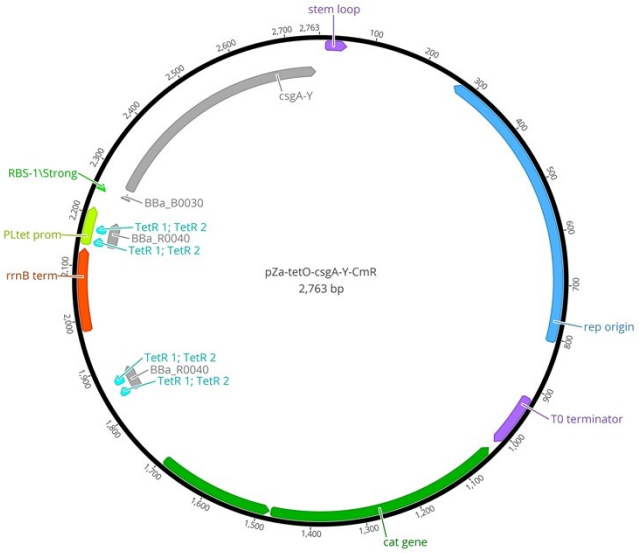

Figure S4 Schematic representation of the expression vector containing *csgAY* gene fragment.

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
GGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGGT

AACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCAT
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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GGCGGCGGTAATGGTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACC
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
CAACGTGGCTTCGGTAACAGCGCTACTCTTGATCAGTGGAACGGCAAAAATTCTGAAATG

ACGGTTAAACAGTTCGGTGGTGGCAACGGTGCTGCAGTTGACCAGACTGCATCTAACTCC
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TCCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTACTAT

CGCAAATACAAAGAGTATGATGACTACTAAACGCGT  2763
||||||||||||||||||||||||||||||||||||
CGCAAATACAAAGAGTATGATGACTACTAAACGCGT  651
```

Figure S5 Sequence analysis of *csgAY* gene fragment. Upper DNA sequence is the reference and lower one is the cloned DNA sequence.

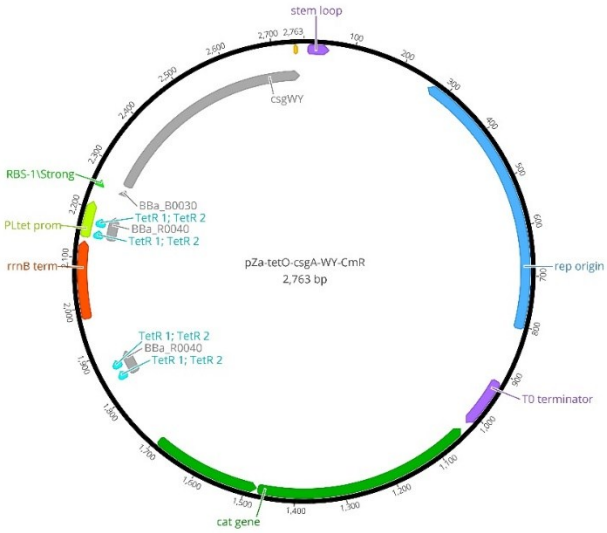

Figure S6 Schematic representation of the expression vector containing the *csgAWY* gene fragment.

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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CTGAGCACATCAGCAGGACGCACTGACCGAATTCTACCATTCACCTCTTGGATTTGGGTA
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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TCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGGTG
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGGTG

GTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGGTA
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
GTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGGTA

ACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATG
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
ACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCATG

GCGGCGGTAATGGTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGACCC
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
CCGTCAACGTGACTCAGGTTGGCTTTGGTAACAACGCGACCGCTCATCAGTACTACTATC

GCAAATACAAAGAGTACGATGATTGGTAAACGCGT  2763
||||||||||||||||||||||||||||||||||
GCAAATACAAAGAGTACGATGATTGGTAAACGCGT  653
```

Figure S7 Sequence analysis of *csgAWY* gene fragment. Upper DNA sequence is the reference and lower one is the cloned DNA sequence.

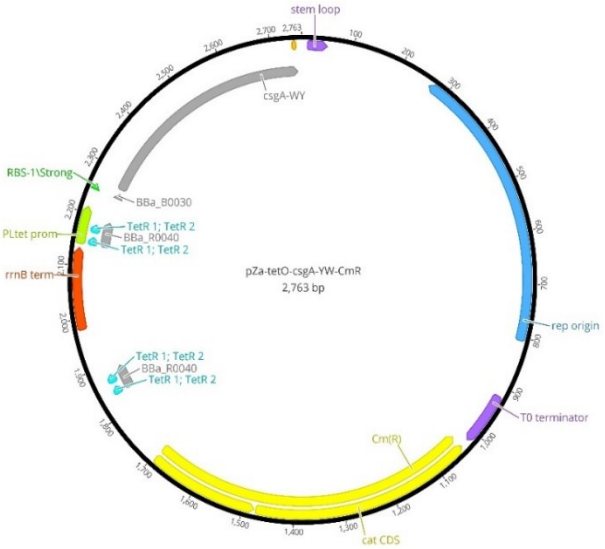

Figure S8 Schematic representation of the expression vector containing the *csgAYW* gene fragment

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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ATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGG
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
ATTCTCCGGTAGCGCTCTGGCAGGTGTTGTTCCTCAGTACGGCGGCGGCGGTAACCACGG

TGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGG
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TGGTGGCGGTAATAATAGCGGCCCAAATTCTGAGCTGAACATTTACCAGTACGGTGGCGG

TAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCA
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
TAACTCTGCACTTGCTCTGCAAACTGATGCCCGTAACTCTGACTTGACTATTACCCAGCA

TGGCGGCGGTAATGGTGCAGATGTTGGTCAGGGCTCAGATGACAGCTCAATCGATCTGAC
||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
CCAACGTGGCTTCGGTAACAGCGCTACTCTTGATCAGTGGAACGGCAAAAATTCTGAAAT

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||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
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TCGCAAATACAAAGAGTGGGATGATTATTAAACGCGT  2763
||||||||||||||||||||||||||||||||||||
TCGCAAATACAAAGAGTGGGATGATTATTAAACGCGT  650
```

Figure S9 Sequence analysis of csgAYW gene fragment. Upper DNA sequence is the reference and lower one is the cloned DNA sequence.

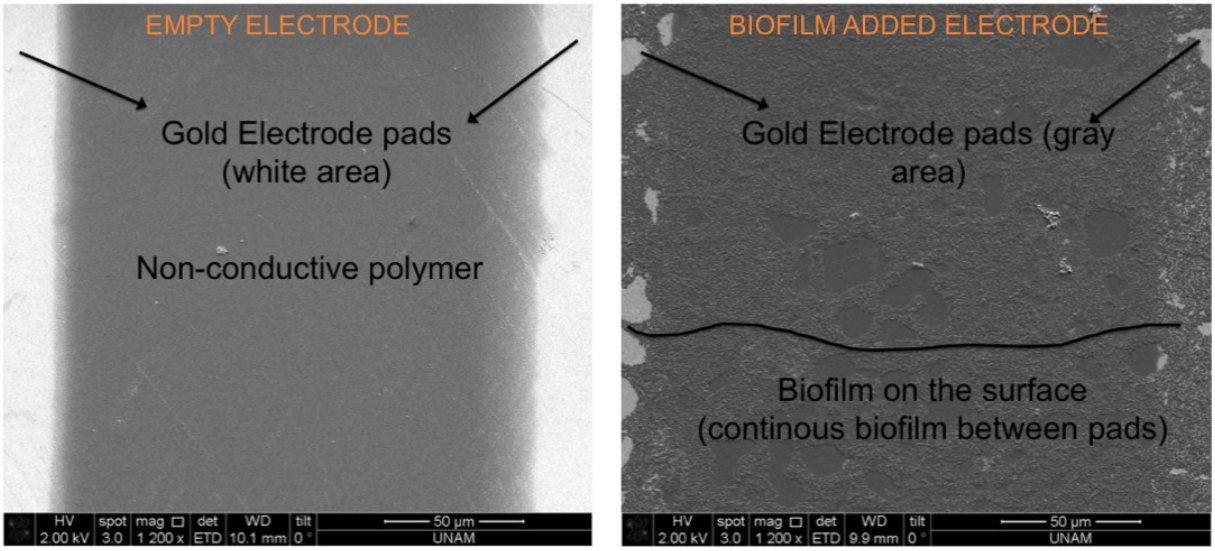

Figure S10. Interdigitated gold electrodes before and after the addition of the biofilms on surface for conductivity measurements.

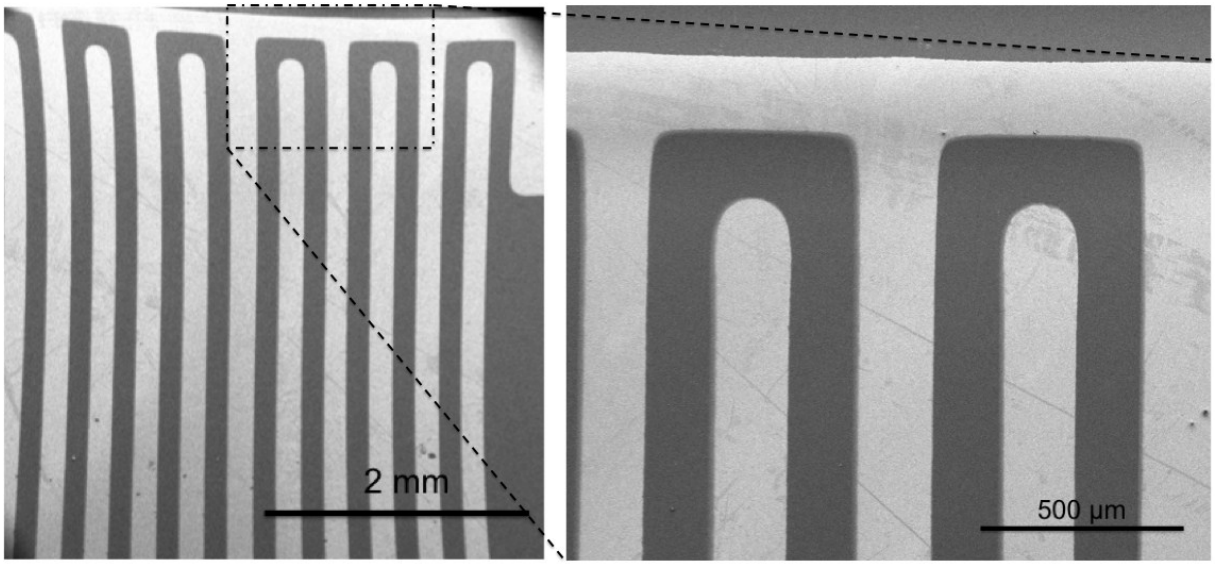

Figure S11. Empty interdigitated electrode and its detail showing the successful deposition of the gold through the mask used.

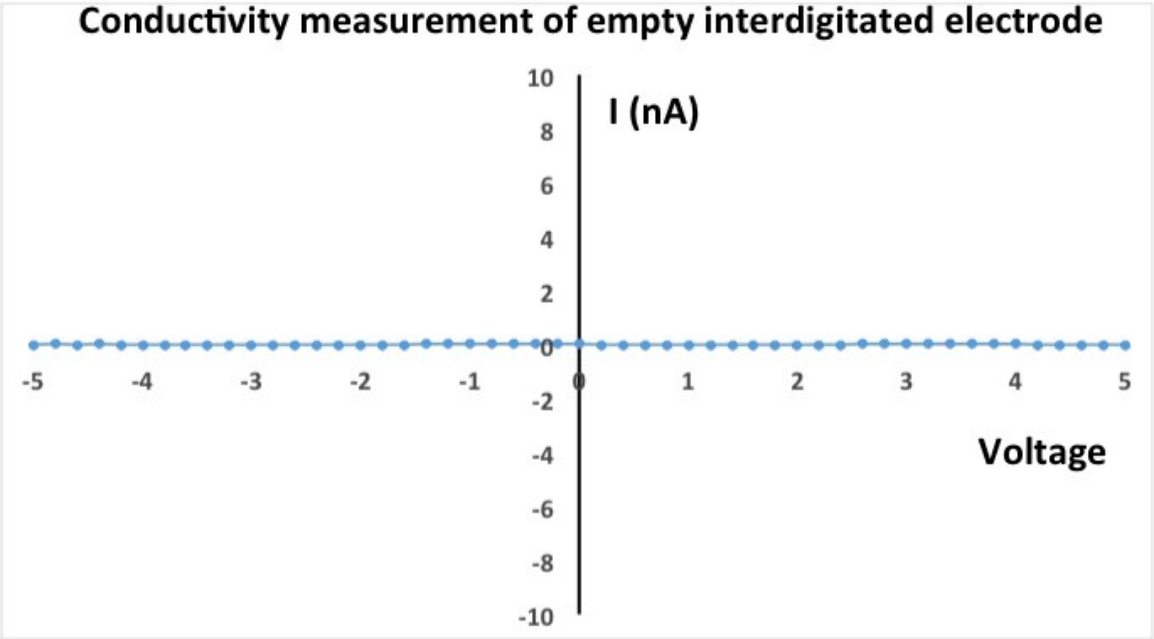

Figure S12. Conductivity measurement of the empty electrode