

## Supplementary Information

### Repurposing Bacterial Extracellular Matrix for Selective and Differential Abstraction of Rare Earth Elements

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**Table S1.** Plasmid inserts used in this study.

Plasmid Name	Nucleotide Sequence of Insert	Comments
pET21d- P <sub>T7</sub> :LBT2	GGTTCATCTGGTAGTGGCGGTTCCGGGT TACATTGACA CTAATAACGATGGATGGATTGAGGGAGATGAGCTTTA CATTGACACGAACAATGATGGATGGATCGAAGGCGAC GAATTACTTGCGTAA TACATCATTGTATTACAGAAA CAGGG	Gray = Flanking plasmid region in pET21d- P <sub>T7</sub> :ΔBF  Red = gene for CsgA-LBT2
pET21d- P <sub>T7</sub> :LBT4	GGTTCATCTGGTAGTGGCGGTTCCGGGT TACATCGATA CCAATAACGACGGCTGGATCGAGGGGGATGAATTATA CATCGACACAAACAATGATGGTTGGATCGAGGGAGAT GAGCTGTACATCGACACGAATAACGATGGGTGGATCG AAGGTGATGAGTTGTATATCGACACTAATAATGATGG TTGGATCGAAGGCCACGAATTGTAA TACATCATTGT ATTACAGAAACAGGG	Gray = Flanking plasmid region in pET21d- P <sub>T7</sub> :ΔBF  Red = gene for CsgA-LBT4
pET21d- P <sub>T7</sub> :LBT6	GGTTCATCTGGTAGTGGCGGTTCCGGGT TACATTGACA CAAACAATGACGGGTGGATCGAAGGGGACGAGTTATA TATCGACACAAACAACGACGGCTGGATTGAAGGCGAT GAGCTTTACATCGACACCAACAACGATGGATGGATCG AGGGGGATGAACTTTACATCGATACTAACAATGATGG ATGGATTGAGGGTGACGAGCTTTACATTGATACTAAC AATGATGGGTGGATTGAAGGTGATGAATTATATATCG ACACCAATAATGACGGATGGATTGAGGGCGATGAGTT GCTTGCCTAA TACATCATTGTATTACAGAAACAGGG	Gray = Flanking plasmid region in pET21d- P <sub>T7</sub> :ΔBF  Red = gene for CsgA-LBT6
pET21d- P <sub>T7</sub> :LBT2*	GGTTCATCTGGTAGTGGCGGTTCCGGGT TACATCGGGA CTAATAATGGTGGTTGGATCGGGGGCGGTGGTCTTTA TATCGGCACGAACAATGGTGGGTGGATCGGCGGGGGA GGTTGCTTGCCTAA TACATCATTGTATTACAGAAA CAGG	Gray = Flanking plasmid region in pET21d- P <sub>T7</sub> :ΔBF  Red = gene for CsgA-LBT2*
pET21d- P <sub>T7</sub> :LBT4*	GGTTCATCTGGTAGTGGCGGTTCCGGGT TACATTGGGA CGAATAACGAGGGTGGATTGGCGGTGGTGGCCTTTA CATTGGCACGAACAATGGTGGGTGGATTGGAGGTGGA GGATTATATATCGGTTACTAACAACGGAGGGTGGATTG GTGGGGGCGGTCTTTATATCGGGACAAACAACGGAGG ATGGATTGGCGGTGGTGGCCTGCTTGCCTAA TACATC ATTTGTATTACAGAAACAGGG	Gray = Flanking plasmid region in pET21d- P <sub>T7</sub> :ΔBF  Red = gene for CsgA-LBT4*

<p>pET21d- P<sub>T7</sub>:LBT6*</p>	<p>GGTTCATCTGGTAGTGGCGGTTTCGGGT TACATCGGAA  CCAATAATGGCGGATGGATCGGGGGAGGGGCCTTAA  CATTGGGACTAATAACGGGGGATGGATCGGGGGAGGA  GGGTTGTATATCGGGACCAACAATGGGGGTTGGATTG  GGGGCGGCGGGTTATATATTGGGACAAACAACGGGGG  CTGGATCGGAGGCGGTGGTCTTTATATCGGAACAAAC  AACGGGGGATGGATTGGAGGGGGTGGACTGTATATCG  GAACAAATAATGGAGGGTGGATTGGTGGAGGGGGTTT  GTTGGCATAA TACATCATTGTATTACAGAAACAGGG</p>	<p>Gray = Flanking plasmid region in pET21d- P<sub>T7</sub>:ΔBF</p> <p>Red = gene for CsgA-LBT6*</p>
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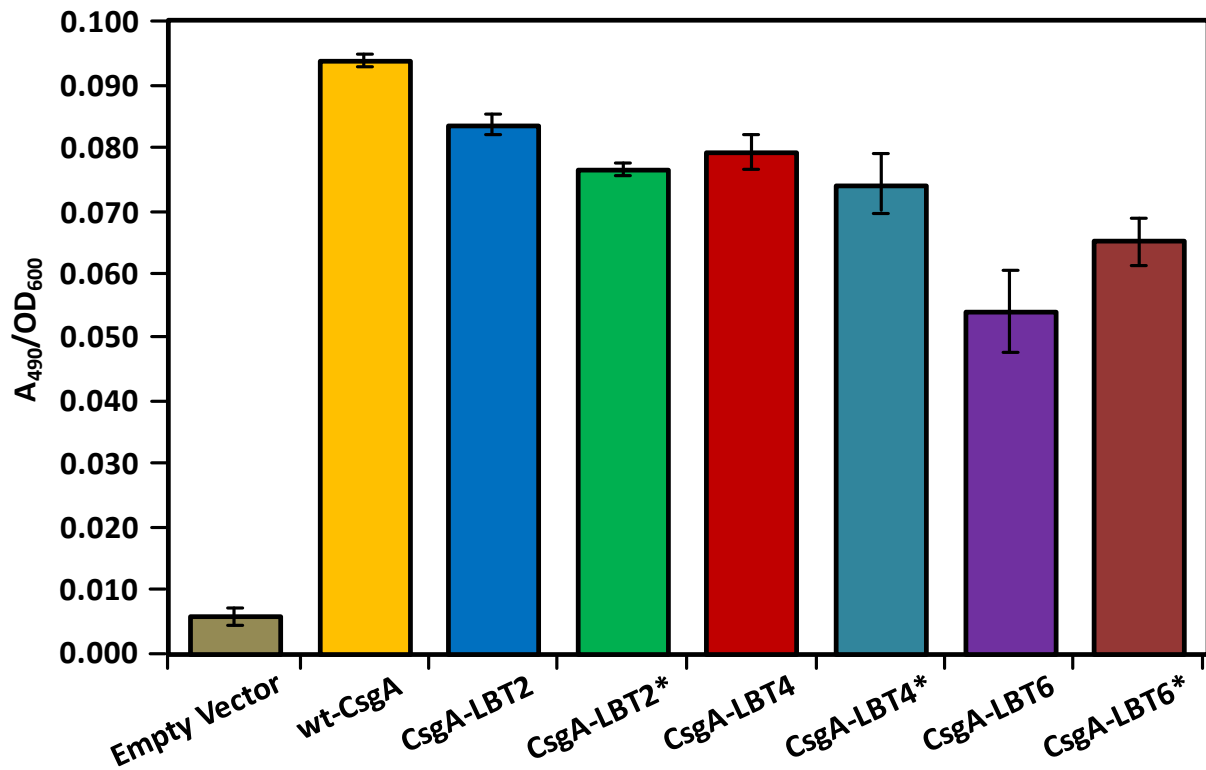


Figure S1. Expression of CsgA containing various concatamers of LBT, as determined by a Congo Red pull-down assay and normalized to cell density. The corresponding LBT\* variants have their acidic residues mutated to glycine. 2 $\times$ - and 4 $\times$ -LBT repeats expressed well relative to wt-CsgA, but a 6 $\times$ -LBT variant showed significantly lower expression, which was partly alleviated by removing the charged residues.

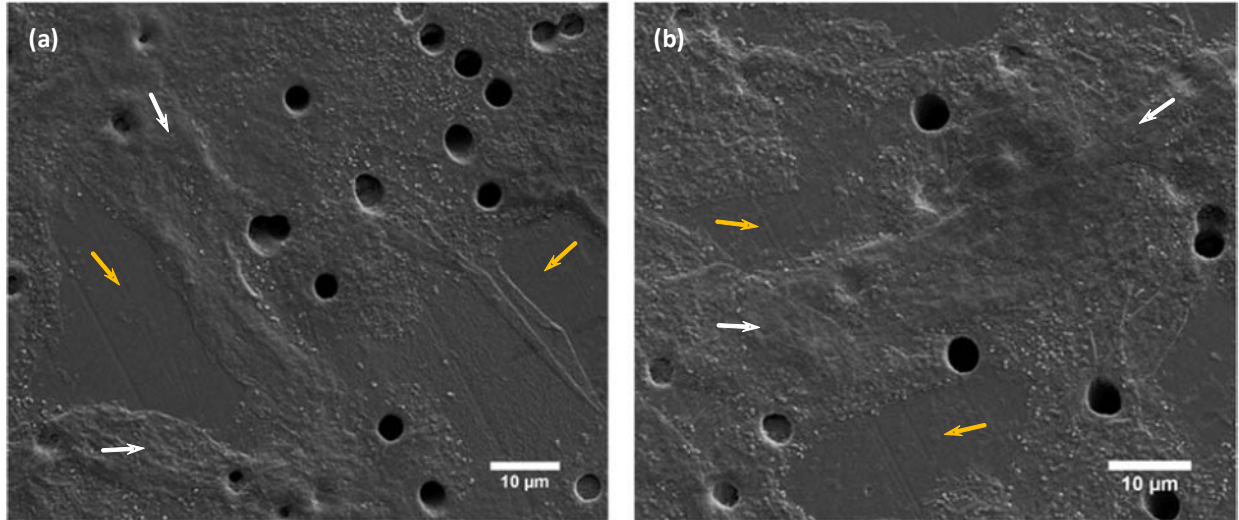


Figure S2. Scanning electron micrographs showing similar extensive fiber meshes formed by wT-CsgA (a) and CsgA-LBT4 (b). The meshes were filter-immobilized onto 5  $\mu\text{m}$  polycarbonate membranes. Yellow and white arrows show filter membrane and curly fiber meshes respectively.

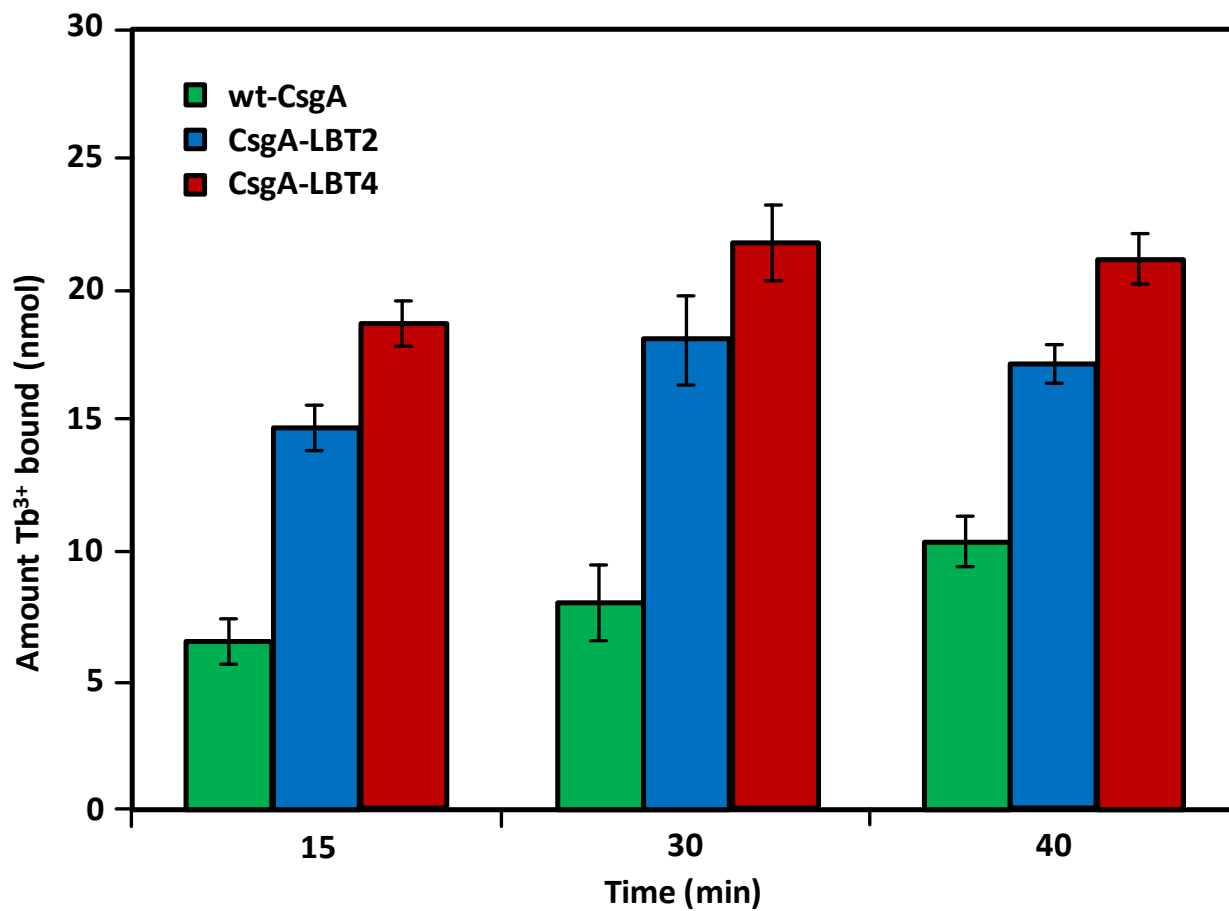


Figure S3. Binding of 200  $\mu\text{M}$   $\text{Tb}^{3+}$  to curli filters over time. Sorption was complete within 30 min.

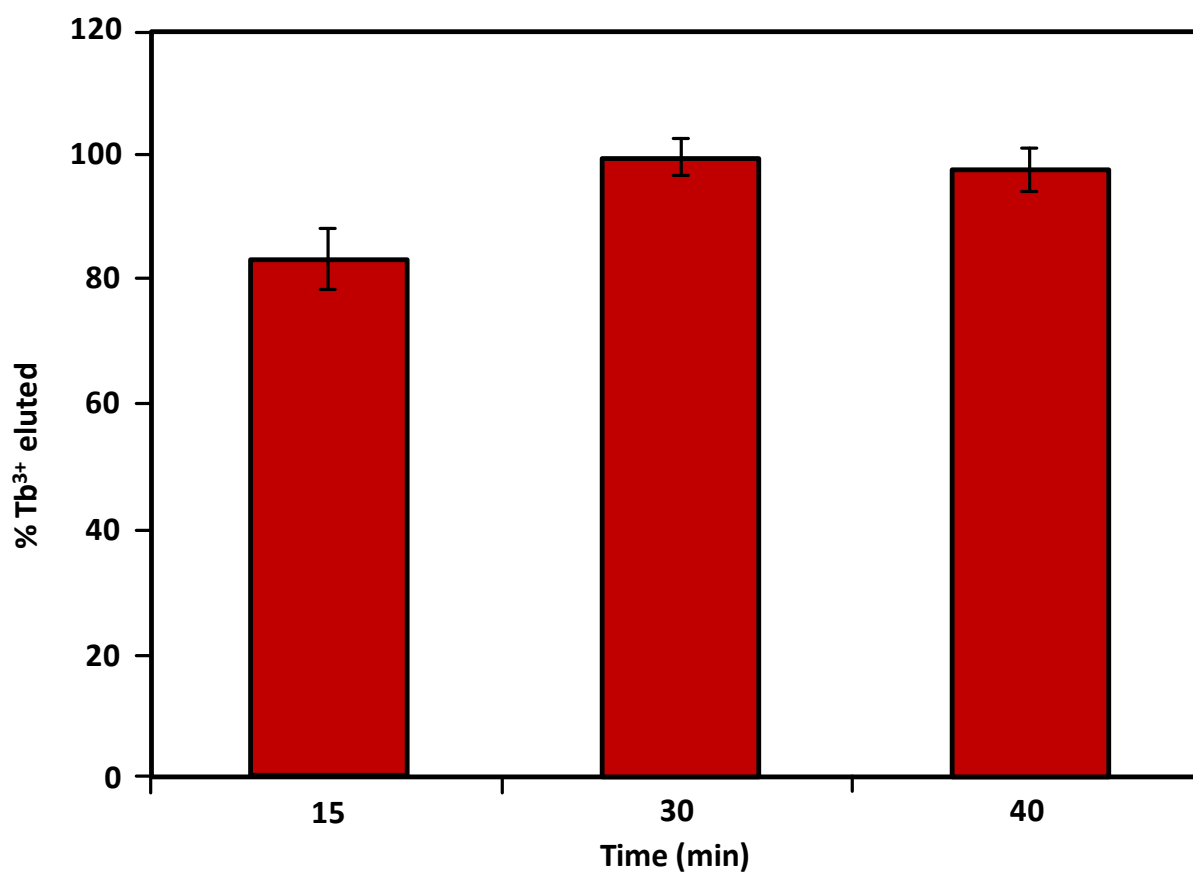


Figure S4. Desorption of Tb<sup>3+</sup> from CsgA-LBT4 filters over time with pH 2 nitric acid at room temperature. All bound Tb<sup>3+</sup> was recovered within 30 min.

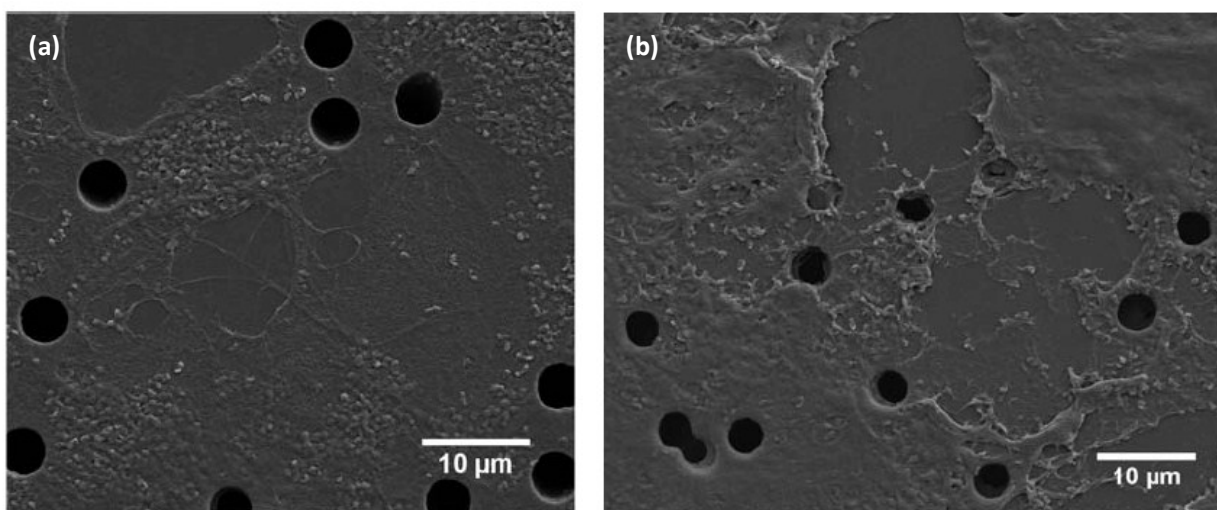


Figure S5. Scanning electron micrograph of CsgA-LBT4 filters before (a) and after (b) three cycles of sorption-desorption, showing that the immobilized fiber mats remained largely intact even after repeated acid washes.



Table S2. Metal composition of simulated waste stream.

<b>Metal</b>	<b>Concentration (<math>\mu\text{M}</math>)</b>
$\text{Ln}^{3+}$	100
$\text{Al}^{3+}$	1000
$\text{Ca}^{2+}$	10000
$\text{Cu}^{2+}$	1000
$\text{Fe}^{3+}$	1000
$\text{Ni}^{2+}$	10000



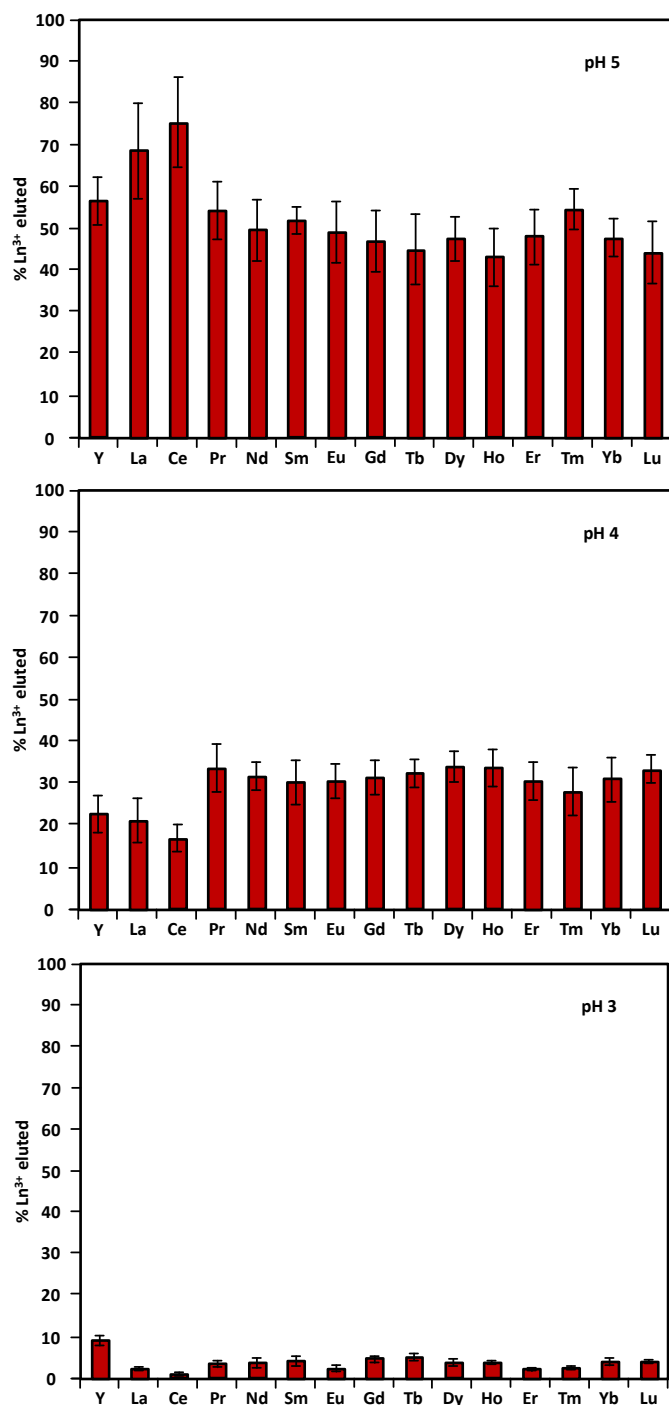


Figure S6. Ln<sup>3+</sup> desorption from curli-LBT filters using a sequential series of acid washes. A proportionally larger amount of the lighter lanthanides (La, Ce) was eluted at higher pH due to their lower affinity to the LBTs.