## Supporting Information

# Engineering Bacteria to Control Electron Transport Altering the Synthesis of Biopolymer

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**Table S1. Bacteria and Plasmid Strains.**

| Strain/Plasmid | Description | Source/Reference |
|---|---|---|
| *Escherichia coli* wild type | Plasmid Storage Strain (K12 Top 10) | Invitrogen |
| pMTL_83153 | Modular plasmid containing pCB102, catP, ColE1 + tra, $P_{fdx}$+ MCS | http://www.clostron.com/pMTL80000.php |

**Table S2.** Oligonucleotide Primers used for PCR of DNA regions. All Primers used for PCR with Q5 ® Polymerase. *Exceptions used for Colony PCR with Green DreamTaq.

| Primers | Sequence (5'-3') | Tm (°C) | Function |
|---|---|---|---|
| NapC_fwd_hifi | GAGCGAAATCATGGGAA ATTCTGACCGTAAG | 61.8 | To amplify *napC* in cloning with **$P_{BAD}$ promoter** |
| NapC_rev_hifi | ATCTCCATGGACGCGTG ACGTTAAAAACCTGGCTC GAC | 59.3 | To amplify *napC* in cloning with **$P_{BAD}$ promoter** |
| $P_{BAD}$_araC-fwd | CAGGAAACAGCTATGAC CGCTTATGACAACTTGAC GGC | 59.3 | Amplify **$P_{BAD}$ promoter** |
| $P_{BAD}$_araC_rev | AATTTCCCATTTTCTCCT CTTTAATCTAGAGAATTC | 58.9 | Amplify **$P_{BAD}$ promoter** |
| ColE + *tra*_F2* | CCATCAAGAAGA GCGAC | 56.7 | **Colony PCR** |
| pCB102_R1* | GATAGTCAAAAGGCATAA CAG | 55.4 | **Colony PCR** |

**Table S3.** Arabinose induction concentrations for *E. coli* containing Inducible Promoter Vector.

| Sample | Stock arabinose (w/v) | Final arabinose Concentration |
|---|---|---|
| *E. coli*$_{(IP\_0\%)}$ | 0 | 0 |
| *E. coli*$_{(IP\_0.000018\%)}$ | 0.0018% | 0.000018% |

| | | |
|---|---|---|
| *E. coli*$_{(IP\_0.0018\%)}$ | 0.18% | 0.0018% |
| *E. coli*$_{(IP\_0.18\%)}$ | 18% | 0.18% |

**Table S4.** Protein standardisation calculations using BCA assay. *Calculated using BSA equation (y=0.0016x). **Note samples were diluted by 2; therefore, the concentrations were doubled to obtain original solution concentrations.

| **Vector** | **Abs$_{562nm}$ (av)** | **Sample conc (µg/mL)*** | **Original conc (µg/mL)**** | **mg/ml** |
|---|---|---|---|---|
| Empty Plasmid | 1.57 | 982.7 | 1965 | 1.97 |
| *E.coli*$_{(IP\_0\%)}$ | 1.63 | 1019 | 2038 | 2.04 |
| *E.coli*$_{(IP\_0.000018\%)}$ | 1.69 | 1053 | 2106 | 2.11 |
| *E.coli*$_{(IP\_0.0018\%)}$ | 1.65 | 1029 | 2058 | 2.06 |
| *E.coli*$_{(IP\_0.18\%)}$ | 1.40 | 873 | 1746 | 1.75 |

**Table S5.** Reagent ratios for *E.coli*$_{IP}$ initiated Fe ATRP.

| **Reagent** | **Ratio** | **Mmol** | **Mass (mg)** | **Vol (uL)** |
|---|---|---|---|---|
| PEGMA | 100 | 0.052 | 17 | 16.2 |
| $FeCl_3.6H_20$ | 4.65 | 0.0024 | 0.65 | - |
| $Me_6$TREN | 13.95 | 0.0072 | 1.7 | 1.9 |
| HEBIB | 2 | 0.0010 | 0.22 | 0.15 |

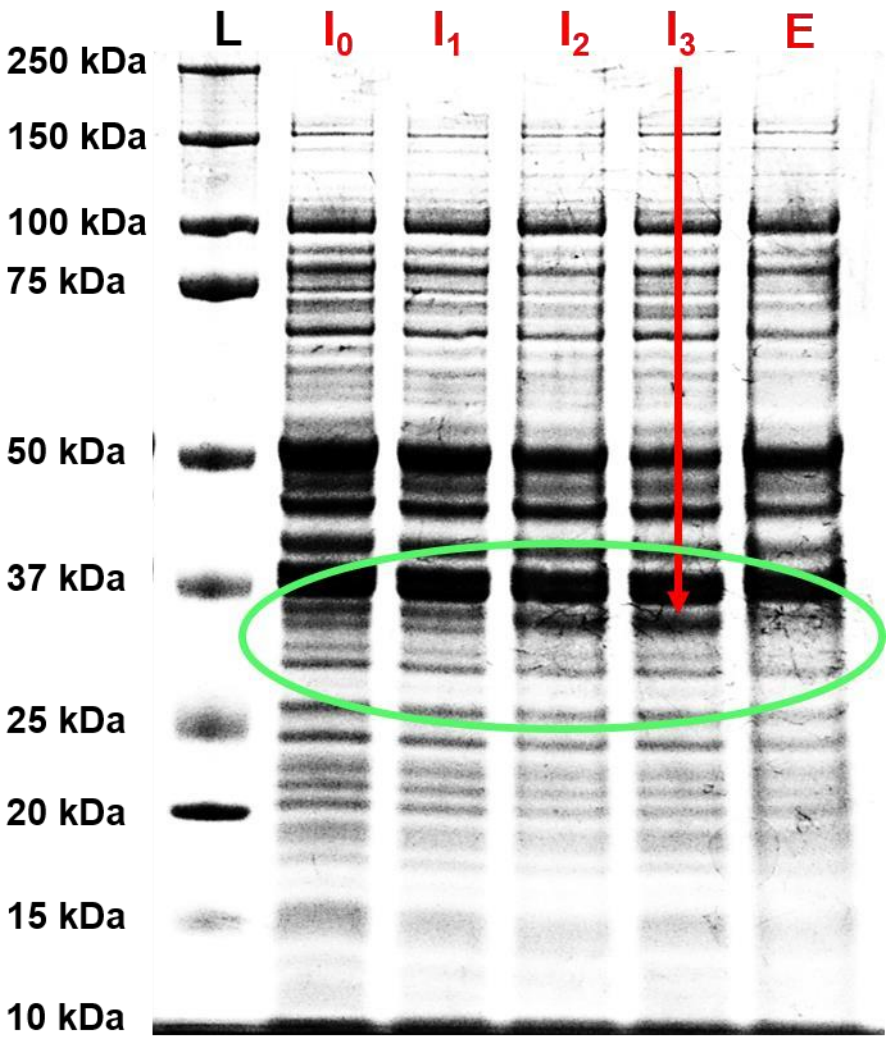


**Figure S1**. Protein expression analysis. SDS PAGE Gel for lysates of bacteria containing empty plasmid (E), Inducible promoter vector with 0% ($I_0$), 0.000018% ($I_1$), 0.0018% ($I_2$) and 0.18% ($I_3$) total arabinose concentration induction. Protein Gel against Precision Plus Protein™ Kaleidoscope ladder (L).

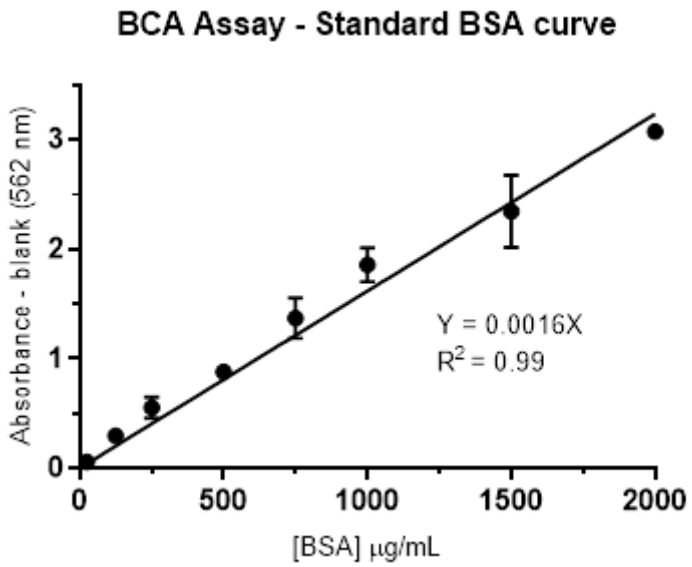


**Figure S2**. BCA Standard curve for BSA (Bovine Serum albumin).

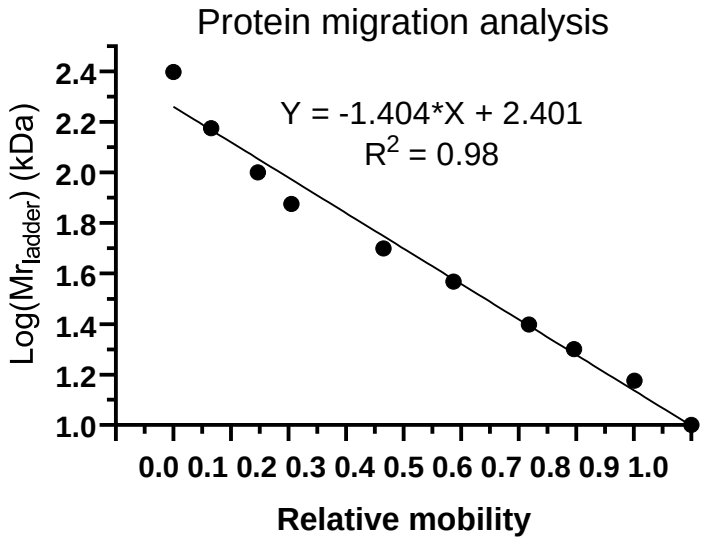


**Figure S3.** Protein migration analysis of protein ladder Log(Mr) against relative mobility on SDS PAGE Gel.

**Calculation:**

Migration (NapC) = 10.7 cm Dye

front = 17.2 cm

$$\text{Relative mobility (X)} = \frac{\text{migration}}{\text{dye front}} \quad \frac{10.7}{17.2} = = 0.622$$

$$Log(Mr_{NapC}) = [-(1.404 * X) + 2.401]$$

$$Log(Mr_{NapC}) = (-1.404 * 0.622) + 2.401$$

$$Mr_{NapC} = 10^{((-1.404*0.622)+2.401)} = 33.7\ kDa$$

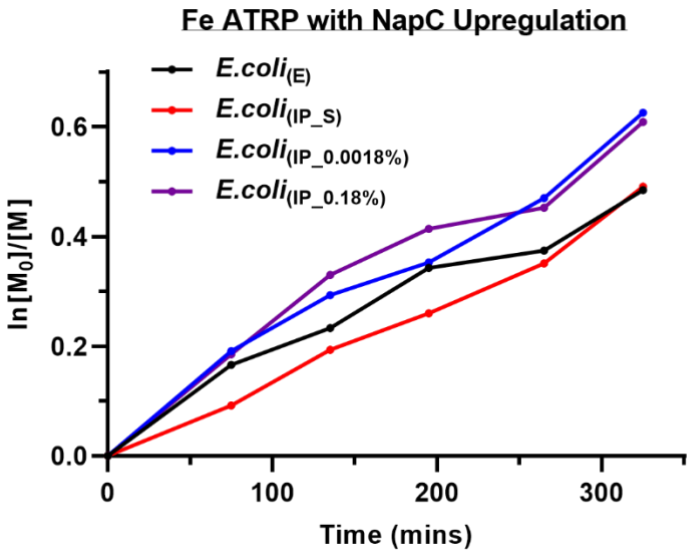


**Figure S4.** $^{1}$H NMR kinetics of Fe ATRP activated by *E. coli* harbouring empty plasmids, *E. coli*$_{(E)}$, or inducible promoter plasmids, *E. coli*$_{(IP)}$ either i) suppressed by addition of glucose *E. coli*$_{(IP\_S)}$, ii) activated by 0.0018% total arabinose concentration *E. coli*$_{(IP\_0.0018\%)}$ or ii) activated by 0.18% total arabinose concentration *E. coli*$_{(IP\_0.18\%)}$.

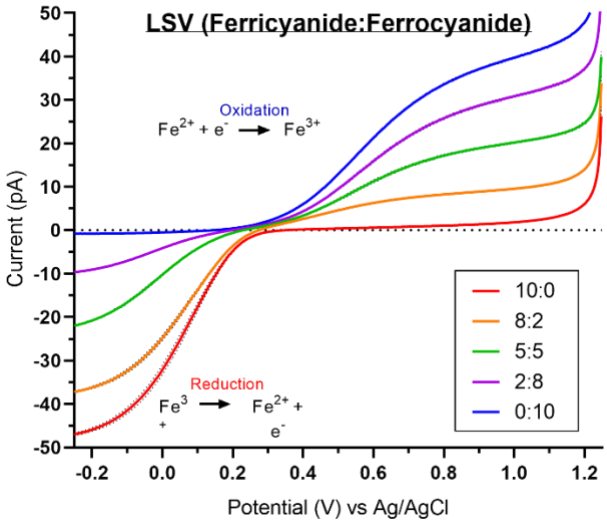


**Figure S5.** Linear sweep voltammogram of Current Vs Potential carried out using 3 electrode system with carbon fibre micro-disk electrode (33 µm), Ag/AgCl reference electrode and Pt counter electrode in 1X PBS electrolyte. Scans were carried out at 100 mV/s from 1.25 V to -0.25 V. 1 mM potassium ferricyanide and ferrocyanide were made in PBS (1X) and mixed in ratios (10:0, 8:2, 5:5, 2:8, 0:10) and voltammograms observed (n=3, error = SD) for each sample, where electrode was polished between each scan.

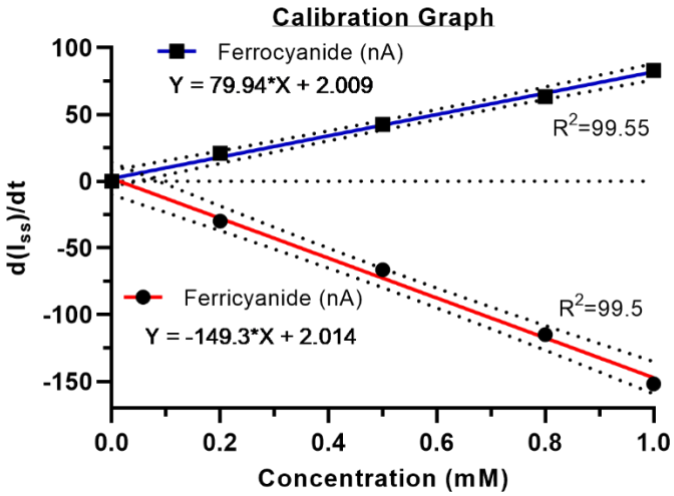


**Figure S6.** Calibration curve to determine Fe concentration. First derivative peaks from graphs in figures S5 and 3a against Ferricyanide or ferrocyanide concentration with line of best fit and 95% confidence limit.

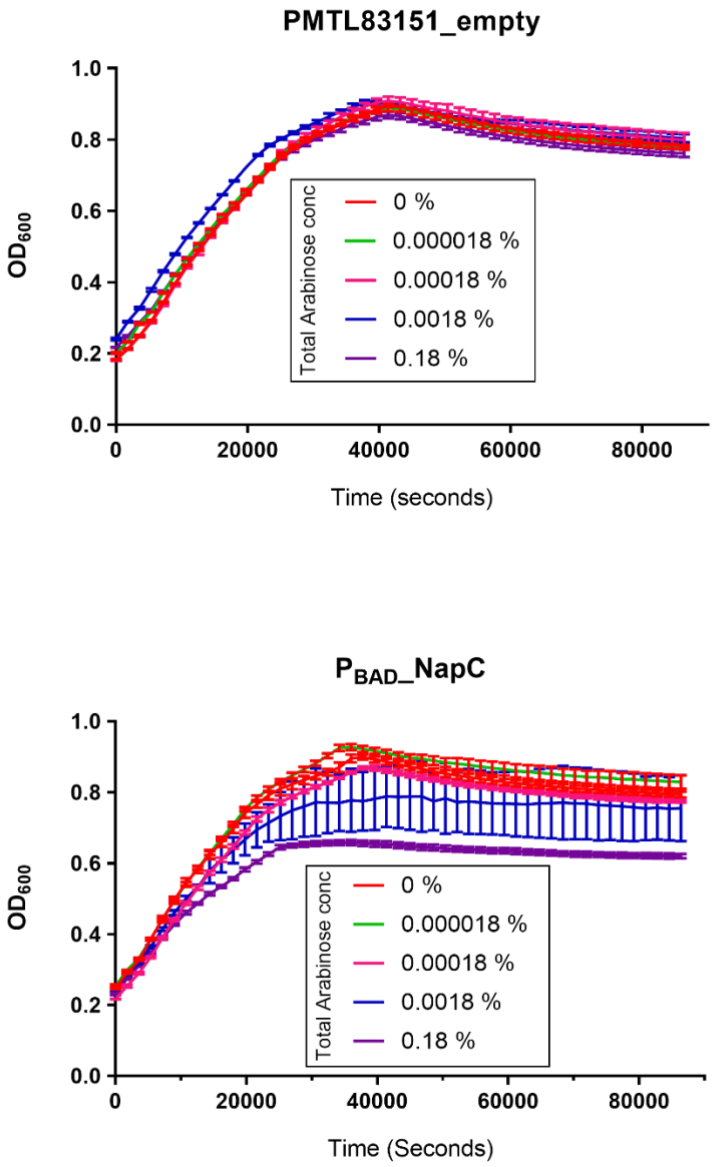


**Figure S7.** Arabinose toxicity study for, Top: *E. coli* containing empty plasmid and Bottom: *E. coli* containing Inducible vector Plasmid at different arabinose concentrations.