sRNA-based knock-down system for Biosynthesis of Phenol from Glucose in *Escherichia coli*

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Phenol is an industrially attractive and commonly used chemical, which is produced from fossil resources mostly. Previously, phenol's biological production from renewable resources has been limited due to its toxicity to microorganisms. Here, we simultaneously engineered 18 Escherichia coli strains for the production of phenol by employing the strategy of synthetic regulatory sRNA technology. sRNA-based knock-down of the two regulators and overexpression of the genes involved in the tyrosine biosynthetic pathway together with tyrosine phenol-lyase in E. coli strains resulted in the production of phenol from glucose. Among the engineered E. coli strains, the BL21 strain produced phenol most efficiently: 419 mg/L by flask culture and 1.69 g/L by fed-batch culture. The final titer and productivity were further improved through biphasic fed-batch fermentation using glycerol tributyrate as an extractant of phenol. The concentration of phenol in the glycerol tributyrate phase and fermentation broth reached 9.84 and 0.3 g/L, respectively, in 21 h, which translates into the final phenol titer and productivity of 3.79 g/L and 0.18 g/L/h, respectively.