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Facile fabrication of a recyclable nanobiocatalyst: Immobilization of Burkholderia cepacia lipase on carbon nanofiber for the kinetic resolution of racemic atenolol intermediate

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(U. C. Banerjee)

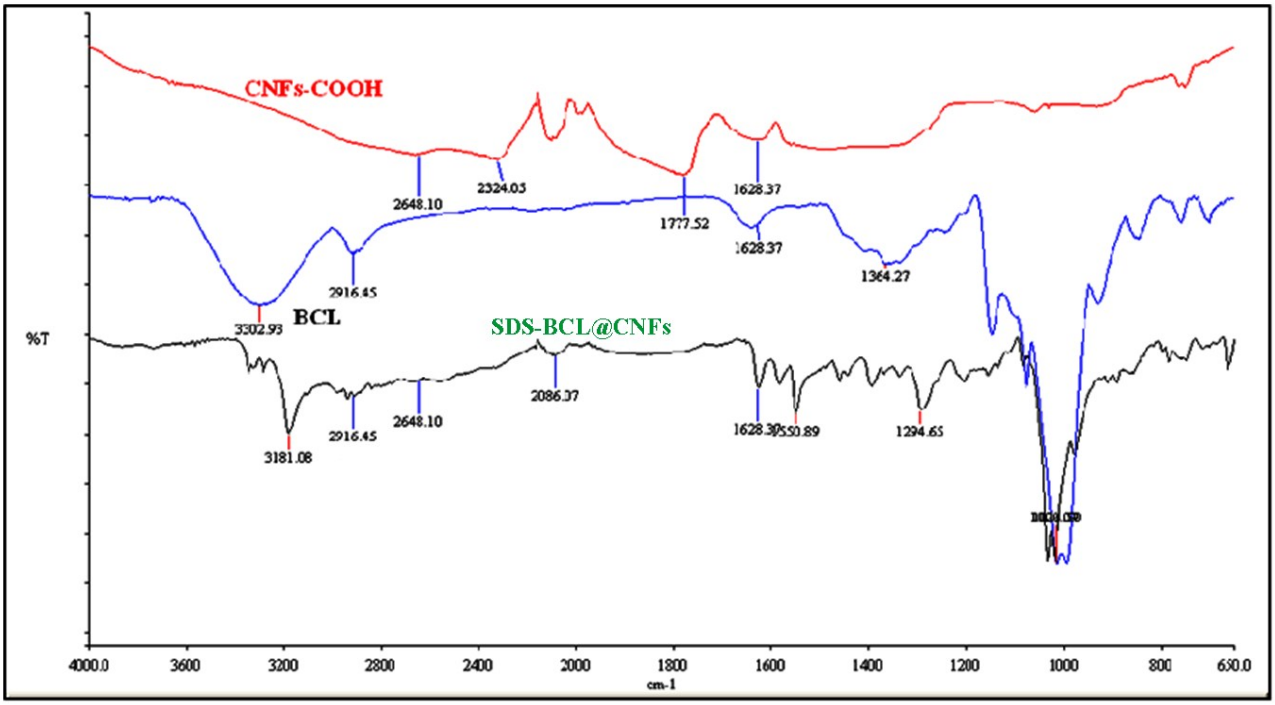

Fig. 1. FTIR spectrum of BCL, CNF-COOH and SDS-BCL@CNF

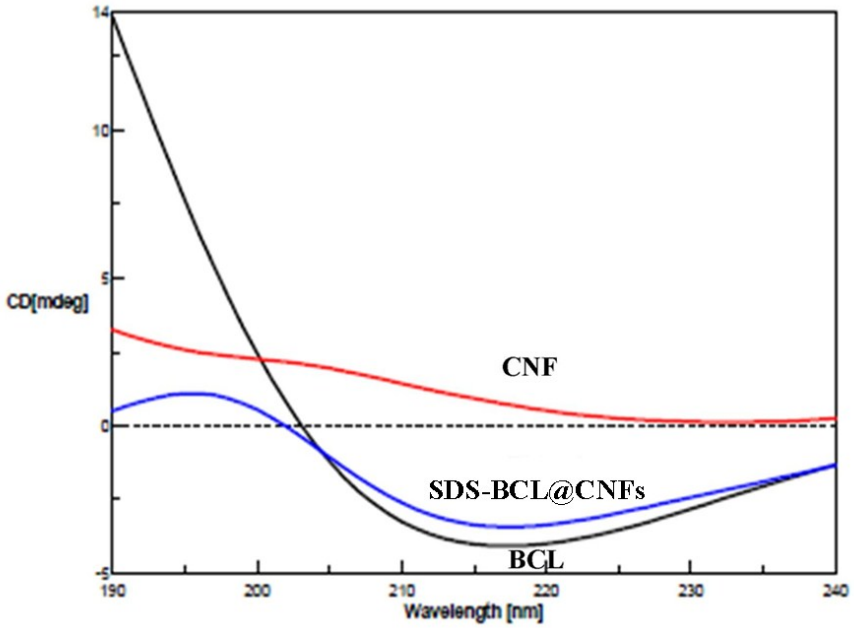

Fig. 2. Circular dichroism (CD) analysis of BCL, activated CNF and SDS-BCL@CNF.

Table 1. Fraction ratio of secondary structure in BCL and SDS-BCL@CNF.

S.No.	Secondary structure	Fraction ratio (%)	
		BCL	SDS-BCL@CNF
1.	Helix	27.6	20.5
2.	Beta	42.7	39.6
3.	Turn	5.20	21.0
4.	Random	24.6	18.6
5.	Total	100	100

Thermodynamic study for free lipase and lipase immobilized on activated carbon nanofibers

Table 2. Comparison of thermostability of lipase in free and immobilized form (SDS-BCL@CNF).

T (°C)	k (min^{-1})	$t_{1/2}$ (min)	ΔG° (kJ/mol)	ΔH (kJ/mol)	ΔS (J/mol)	E_a (kJ/mol)
Free lipase						
40	0.0005	1386±135	96.56±4.1	148.2±6.3	165.1±3.2	150.8±10.4
50	0.0007	990.0±66.2	98.83±4.1	148.2±6.3	152.7±3.2	
60	0.0031	223.5±14.9	97.85±4.1	148.1±6.3	150.8±3.1	
70	0.0461	15.04±6.44	93.17±4.0	148.1±6.3	159.7±3.8	
80	0.3111	2.227±0.082	90.37±4.4	148.0±6.3	163.0±3.2	
90	0.7880	0.8794±0.043	90.21±3.9	148.0±6.3	158.6±3.5	
100	1.986	0.3489±0.096	89.91±4.1	148.0±6.2	155.0±3.2	
Lipase immobilized in SDS-BCL@CNF						
40	0.00030	2310±39.4	97.89±2.7	131.6±6.5	107.7±3.5	134.2±8.6
50	0.00041	1686±30.6	100.3±1.5	131.5±6.5	96.79±3.2	
60	0.00131	529.0±17.6	100.2±2.1	131.5±6.5	93.70±4.6	
70	0.00581	119.3±11.1	100.0±2.4	131.3±6.5	94.08±3.8	
80	0.0172	40.30±9.2	98.87±3.0	131.3±6.5	91.78±4.2	
90	0.4220	1.642±0.15	92.10±3.2	131.3±6.5	107.7±3.4	
100	0.6770	1.023±0.04	93.25±2.3	131.1±6.5	101.5±4.5	

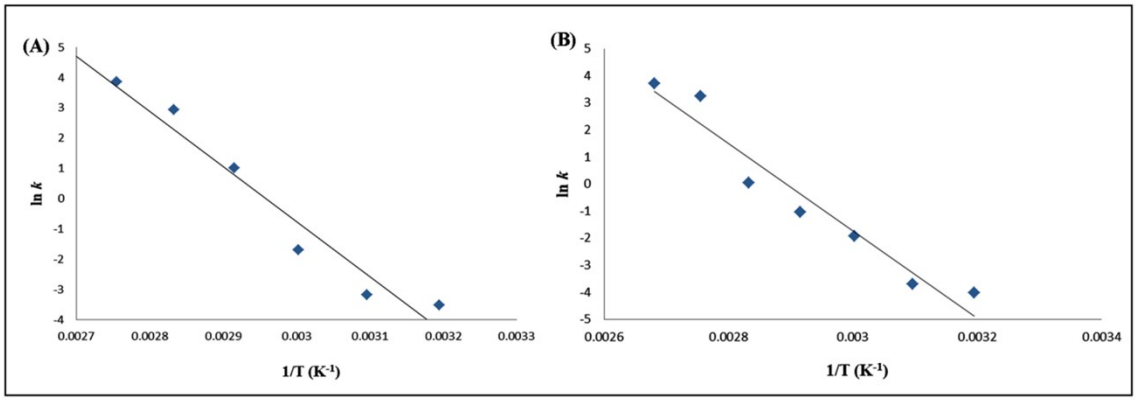

Fig. 3. Arrhenius plot for (A) free lipase and (B) lipase immobilized on activated carbon nanofibers (SDS-BCL@CNF).

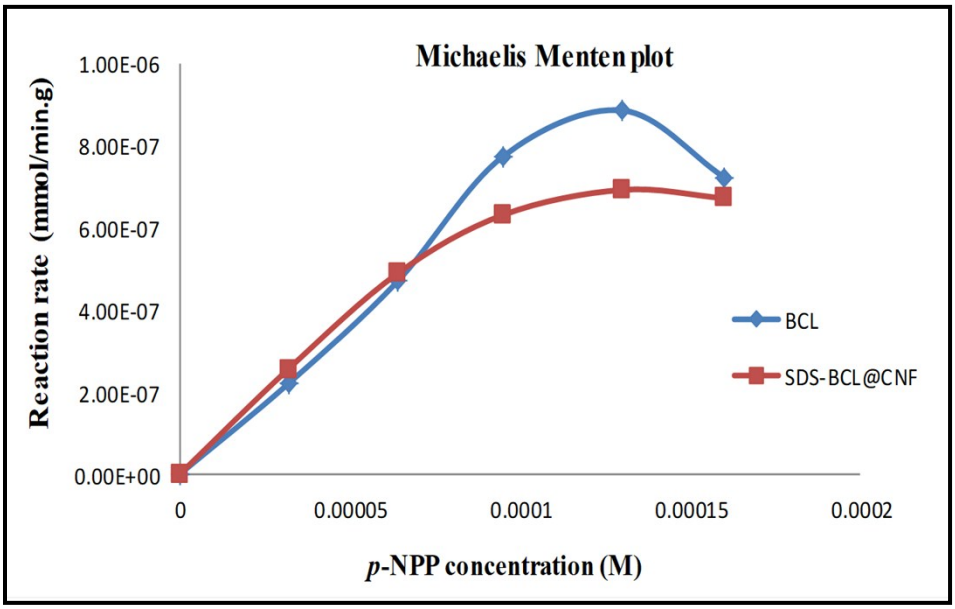

Fig. 4 Effect of *p*-NPP concentration on the initial reaction rate (Michaelis Menten plot).

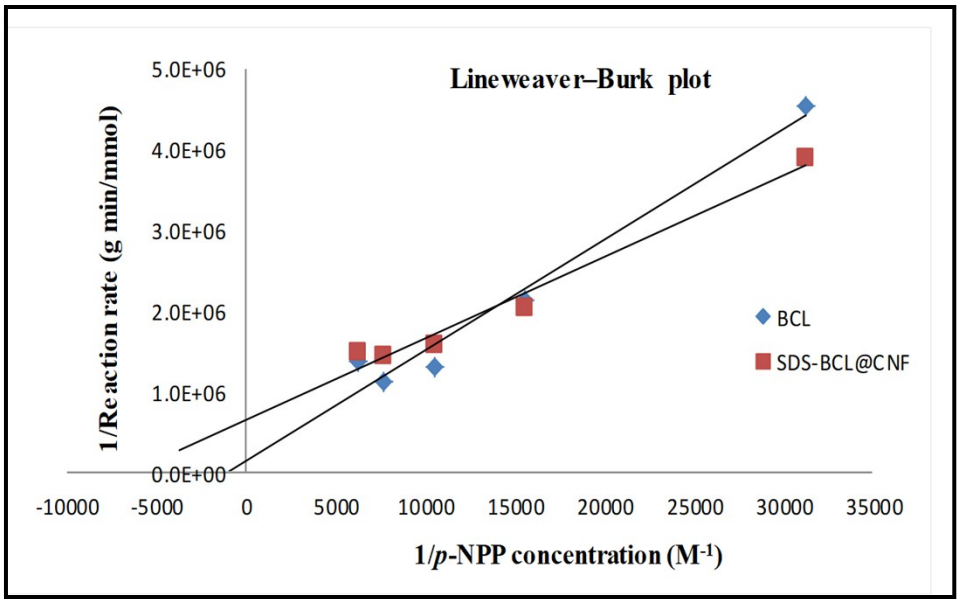

Fig. 5 Effect of *p*-NPP concentration on the initial reaction rate (Lineweaver-Burk plot).

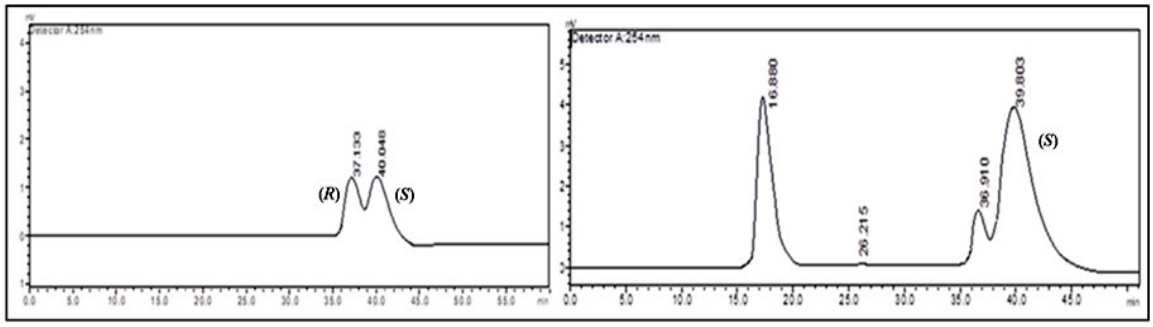

Fig. 6. HPLC chromatogram of kinetic resolution of (*RS*)-2-(4-(3-chloro-2-hydroxypropoxy)phenyl)acetamide using SDS-BCL@CNF.

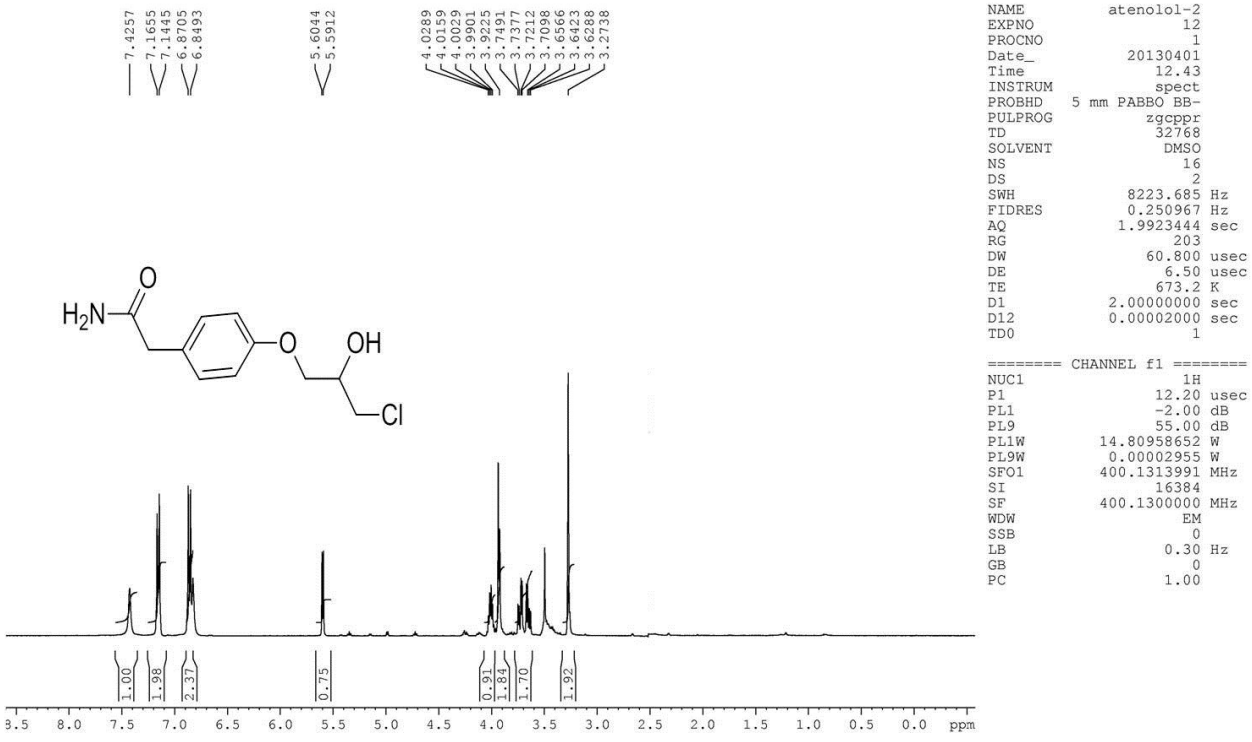

Fig. 7 ^{1}H NMR Spectra of (*RS*)-2-(4-(3-chloro-2-hydroxypropoxy)phenyl)acetamide

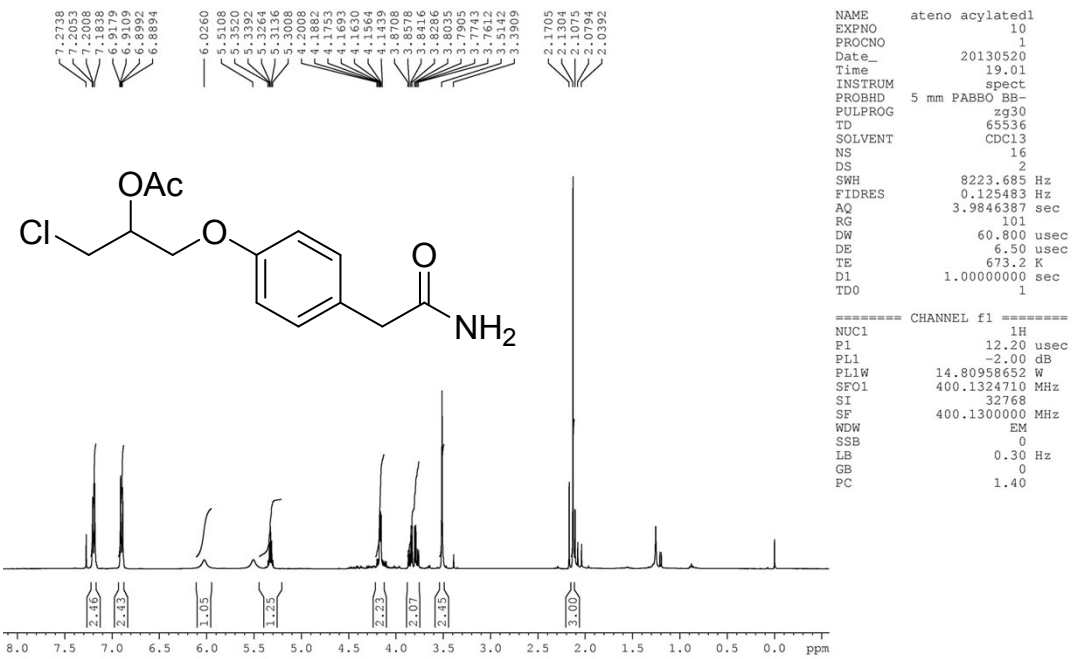

Fig. 8 ^{1}H NMR Spectra of (*RS*)-1-(4-(2-amino-2-oxoethyl)phenoxy)-3-chloropropan-2-yl acetate