Electronic Supplementary Material (ESI) for RSC Advances.

# Characterizing the binding interaction between ultrafine carbon black (UFCB) and catalase: electron microscopy and spectroscopic analysis

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**Paper Summary**

Word count: 4525
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## 1. The dispersion effect of FW200 in tween 80

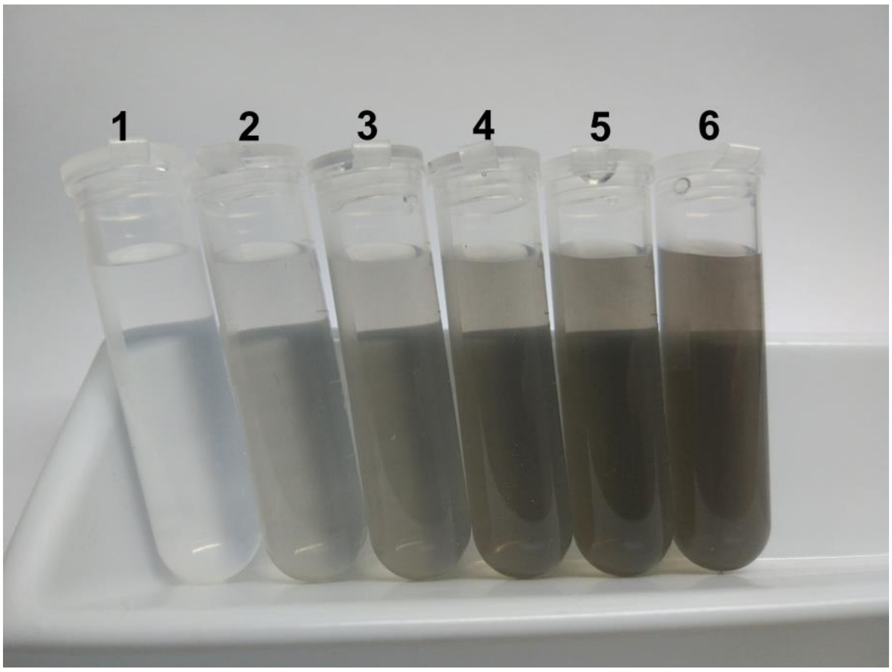


**Figure S1. The image of FW200 dispersed in tween 80. $C_{FW200}$ (1-6) = 0, 10, 20, 30, 40, 50 μg $mL^{-1}$.**

## 2. The Phase Plot of the zeta-potential measurement of FW200-tween 80 mixture.

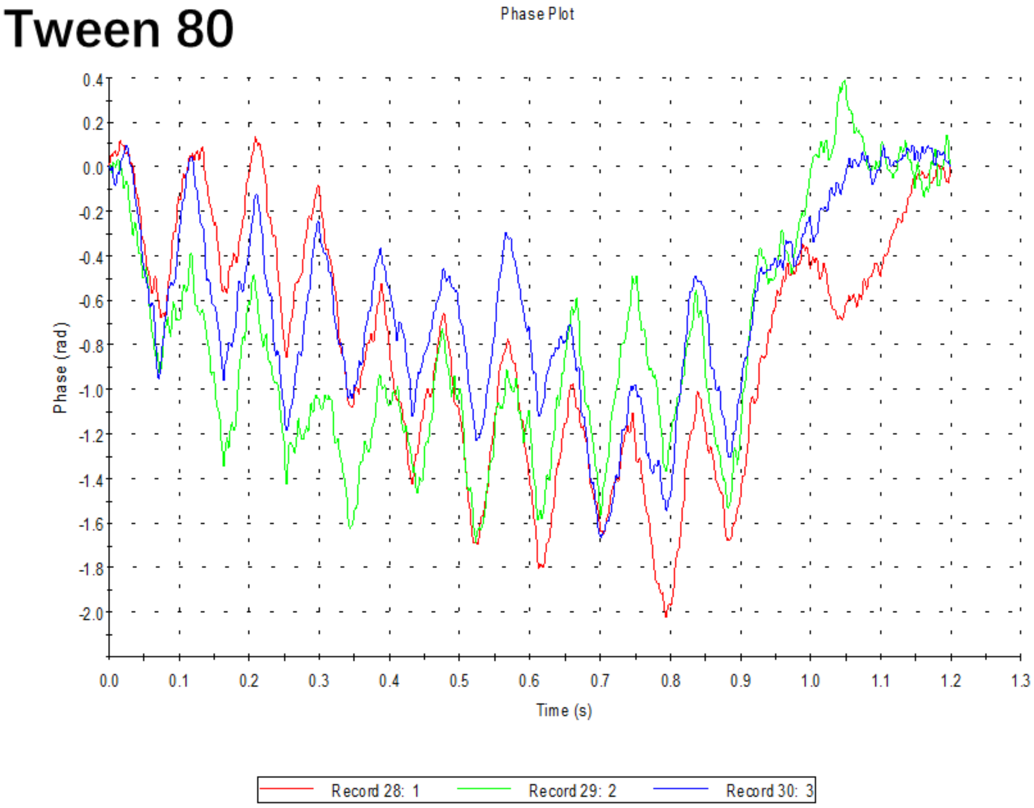


**Figure S2.** Phase plot of FW200-tween 80.

## 3. **Inner-filter effect of FW200-CAT system**

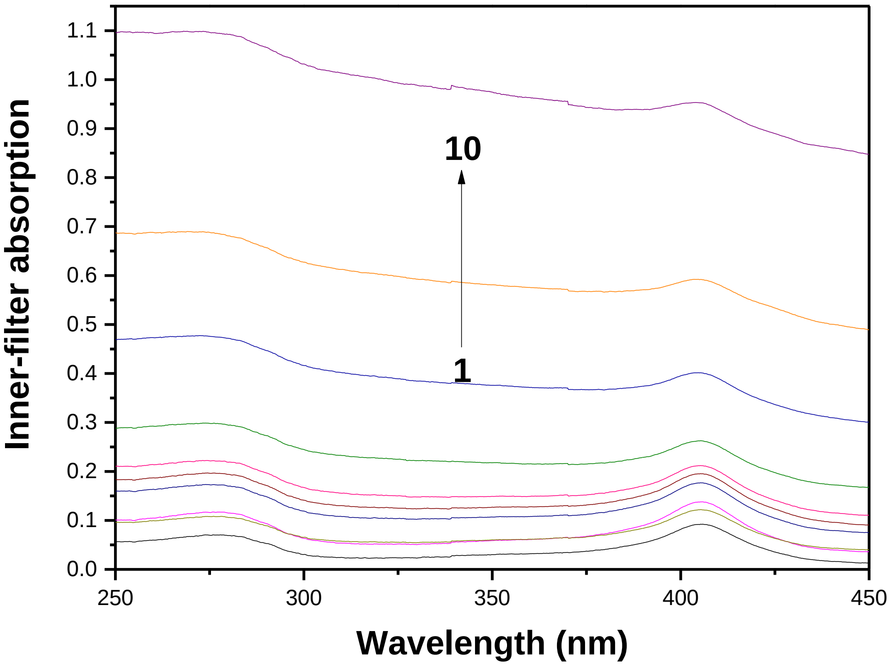


**Fig. S3** The inner-filter effect of FW200-CAT system. Conditions: $C_{CAT}$: 2 μM, $C_{FW200}$ = 0, 5, 15, 20, 25, 30, 35, 40, 45, 50 μg mL$^{-1}$. pH = 7.4, T= 300K

## 4. Inner-filter effect of T80-CAT system

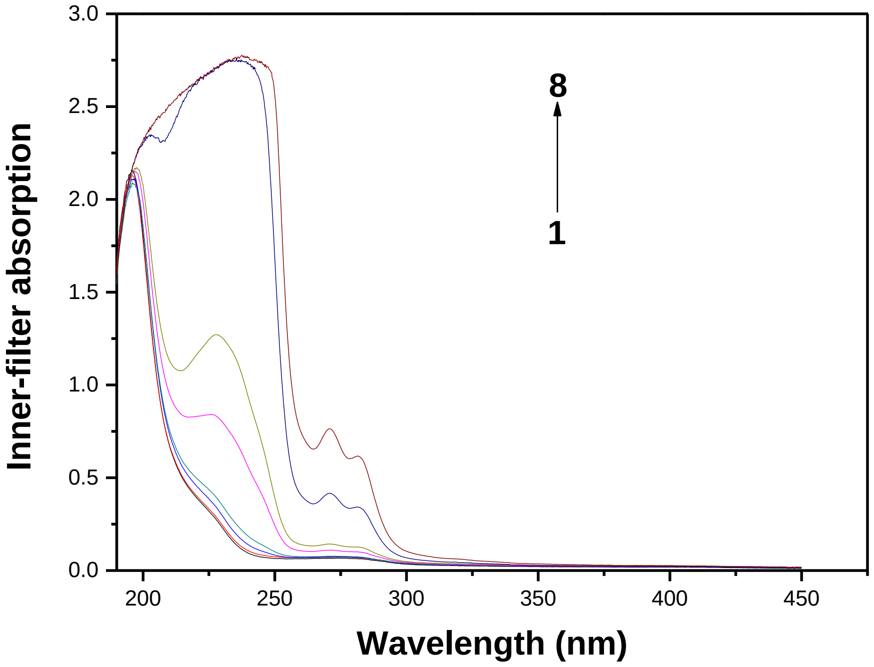


**Fig. S4** The inner-filter effect of T80-CAT system. Conditions: $C_{CAT}$: 2 μM, $C_{T80}$ = 0, 1, 5, 10, 20, 30, 40, 50 μg $mL^{-1}$. pH = 7.4, T= 300K

## 5. RLS spectra measurement

As shown in Figure S 1A and B, with FW200 (tween 80 as dispersant) being titrated into the catalase (CAT) solution and the Milli-Q water, the RLS intensity of these two solutions increased dose-dependently. The changing extent of the FW200-CAT solution was larger than that of the Milli-Q water with FW200 alone, suggesting that the increase of RLS intensity of the FW200-CAT system was caused by the binding between FW200 nanoparticles and CAT.

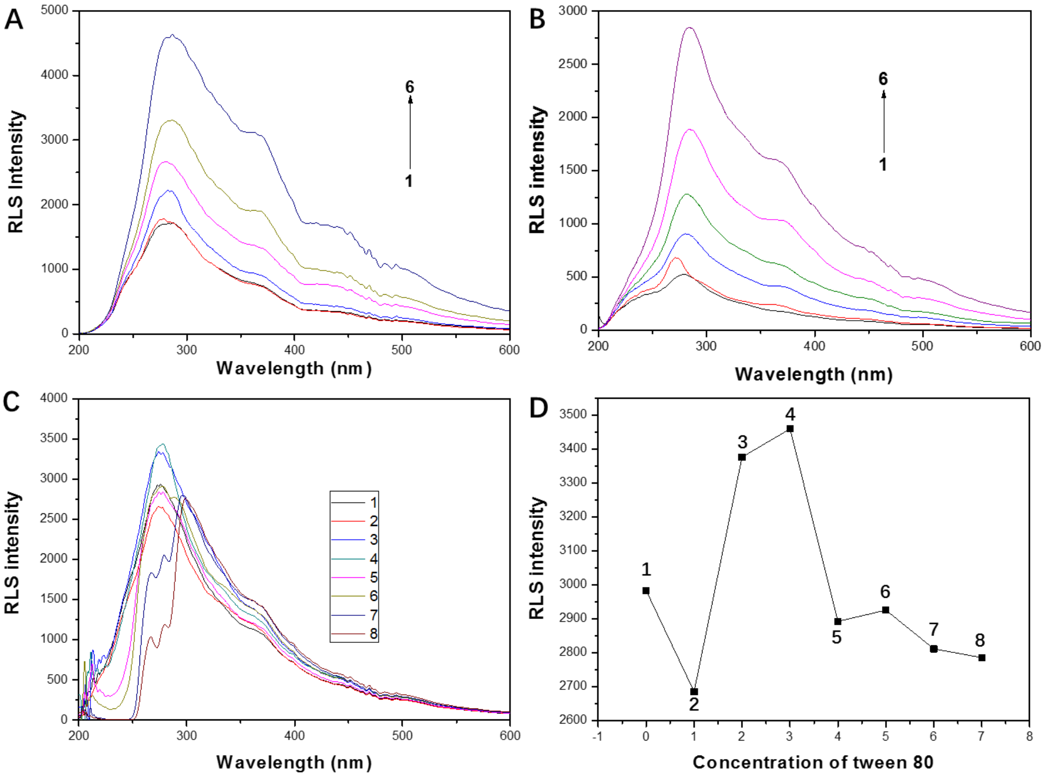
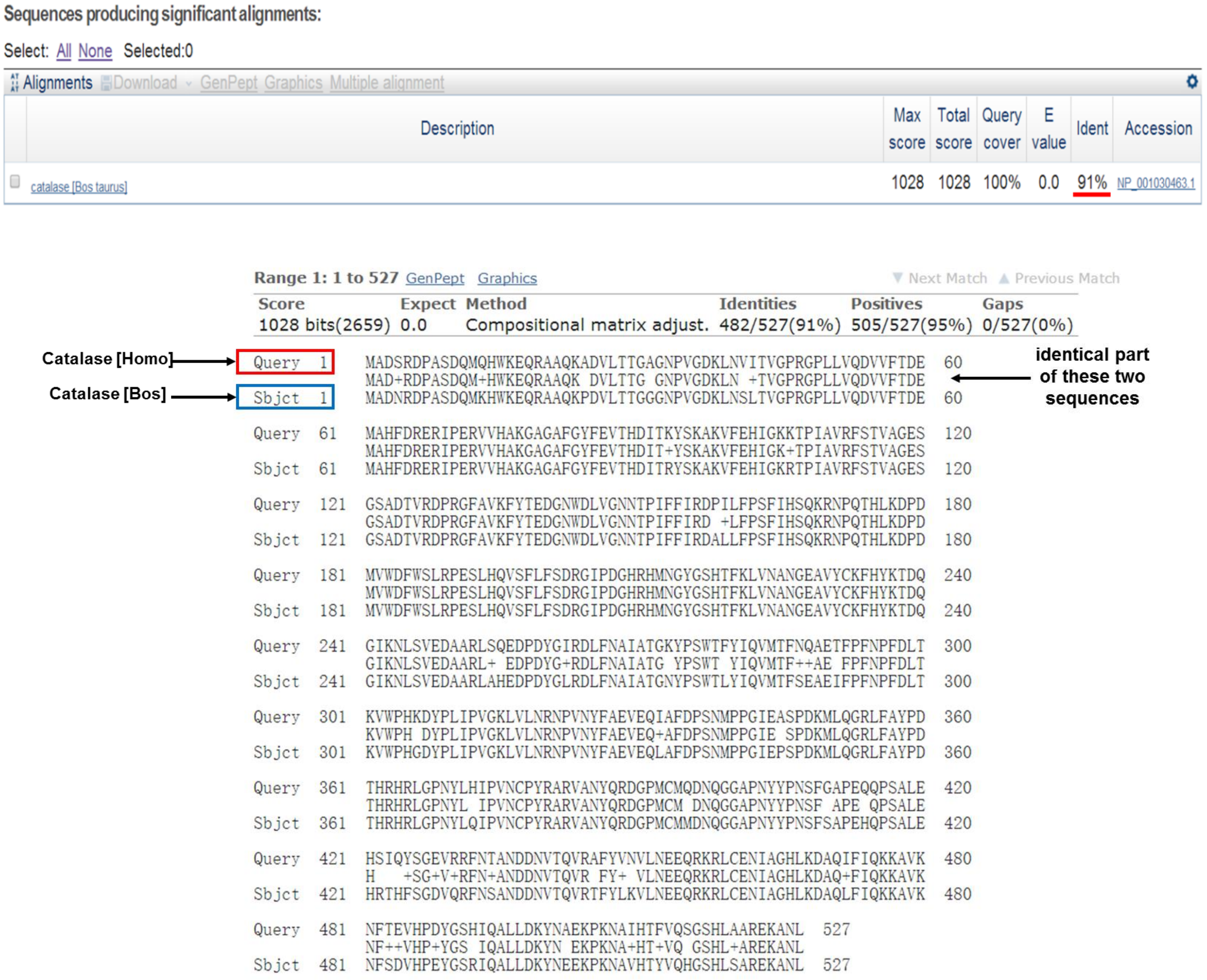


**Fig. S5** RLS spectra: A: FW200-CAT system, B: FW200 alone, C: tween 80-CAT system, D: maximum RLS intensity of tween 80-CAT derived from C. Conditions: $C_{FW200}$ = 0, 10, 20, 30, 40, 50 μg $mL^{-1}$, $C_{tween\ 80}$ = 0, 1, 5, 10, 20, 30, 40, 50 μg $mL^{-1}$, $C_{CAT}$ = 2 μM.

## 6. Homologous identity of bovine catalase and mouse catalase

Bovine catalase has a 91% homologous identity with homo catalase, so it is profound to use bovine liver catalase in the molecule level toxicity.



Sequences producing significant alignments:

Select: All None Selected:0

| | Description | Max score | Total score | Query cover | E value | Ident | Accession |
|---|---|---|---|---|---|---|---|
| ☐ | catalase [Bos taurus] | 1028 | 1028 | 100% | 0.0 | 91% | NP_001030463.1 |

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Range 1: 1 to 527 GenPept  Graphics

Score            Expect  Method                          Identities     Positives      Gaps
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**Fig. S6** homologous identity of bovine catalase and homo catalase. The data was obtained from the NCBI (National Center for Biotechnology Information) and contrast between these two sequences was conducted by using BLAST (Basic Local Alignment Search Tool).