

1 **Synthesis of lipase-hydrogel microspheres and**
2 **their application in deacidification of high-acid**
3 **rice bran oil**

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23 2.9. Water absorption test of PHAMs

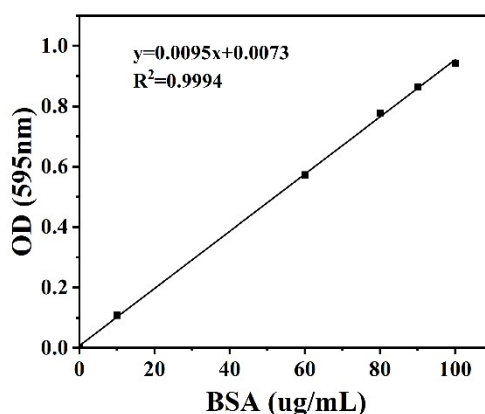
24 The 0.3 g of dried PHAM3 was uniformly dispersed on the glass plate, and
25 PHAM3 was rewatered by means of atomizer water supply. The atomizer was placed
26 above the plate so that the water mist could uniformly wet PHAM3. The free water that
27 had not been absorbed by PHAM3 on the plate was wiped every 10 min and its weight
28 was measured until the weight of PHAM3 reached equilibrium and no longer changed.
29 The amount of water absorbed (A) was calculated by the following formula:

$$A = \frac{W_a - W_b}{m} \times 100\%$$

31 W_a and W_b are the weights of PHAM3 before and after water absorption, and m was
32 the total amount of water absorbed by PHAM3. Each result was obtained by averaging
33 three individual experiments.

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35 **Table S1** The specific surface area and pore size of the PHAM3, L-PHAM3 and L-PHAM3
36 after 10 cycles.

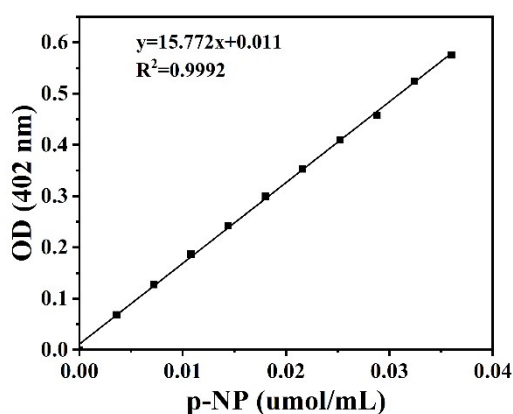
Samples	Surface area (m ² /g)	Average pore diameter (nm)
PHAM3	5.30	14.24
L-PHAM3	1.82	4.01
L-PHAM3 after 10 cycles	2.93	0.01



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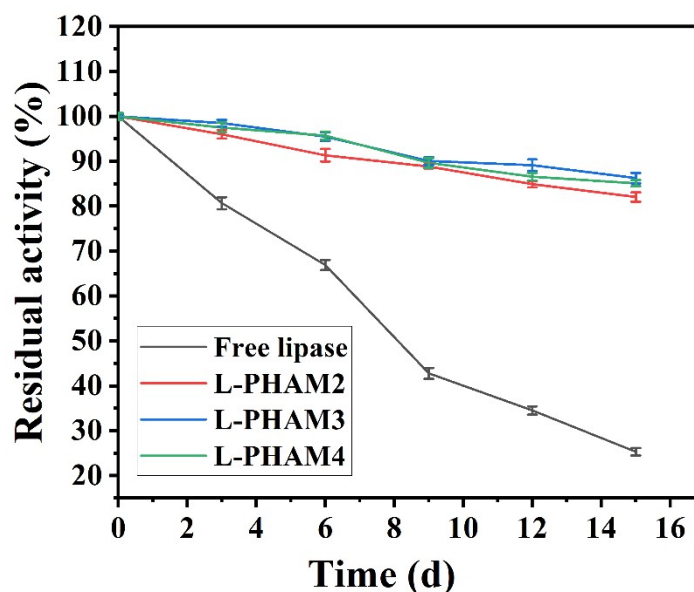
Fig. S1 The standard curve of BSA



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Fig. S2 The standard curve of *p*-NP



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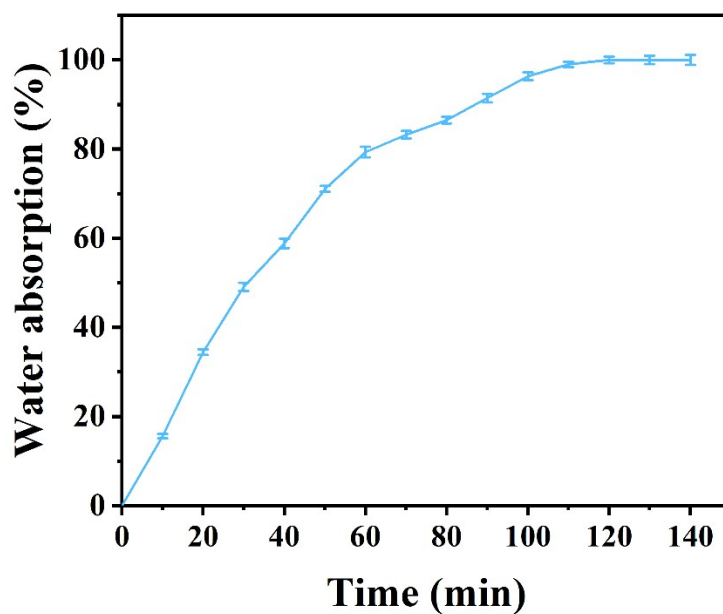
Fig. S3 The storage stability of free lipase, L-PHAM2, L-PHAM3 and L-PHAM4

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45 **3.5. The water absorption test of PHAMs**

46 The catalytic activity of PHAMs in a hydrophobic environment depended on the
47 "micro-water environment" provided by controllable free water in hydrogels.
48 Therefore, it was necessary to measure the water absorption of hydrogel microspheres.
49 The water absorption test result of PHAM3 was shown in Fig. S4, the change of water
50 absorption showed that PHAM3 absorbed water rapidly at first, then slowly. After
51 about 15 min, the water absorption of PHAM3 reached about 1/3 of the total water

52 absorption rate, and after 40 min, it reached about 2/3. After 110 min, the quality of
53 PHAM3 tended to be stable and no longer increased, and the water absorption reached
54 saturation. The above results showed that PHAMs had excellent water absorption and
55 could provide a controllable "micro-water environment" for the organic phase.



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Fig. S4 Water absorption test of PHAM3