Supporting Information for

Spatial co-localization of multi-enzymes by inorganic nanocrystal-protein complexes

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Materials

Chemicals including Na₂HPO₄, KH₂PO₄, NaCl, β-D-glucose and CuSO₄ were purchased from Alfa Aesar. Glucose oxidase, horseradish peroxidase, 2,2'-azino-di-3-ethylbenzothiazoline sulfonic acid-6-diammonium salt (ABTS), Amplex Red, 6-NBDG were
purchased from Sigma Aldrich. Distilled water was obtained from a Milli-Q Biocel water purification system.

Figure S1. Structural characterizations of multi-enzyme incorporated complexes. a-c, SEM images of (a) HRP@GOx, (b) GOx@HRP, and (c) GOx-HRP. d, XRD patterns of GOx@HRP (Top), complex without enzymes (Middle) and the Cu$_3$(PO$_4$)$_2$·3H$_2$O (JPSUC 00-022-0548) (Bottom). e, Thermogravimetric analysis (TGA) of GOx@HRP.
Figure S2. Confocal Z-stack images of GOx@HRP. HRP and GOx were labeled with RhB (Red) and FITC (Green), respectively. Images were collected at 1 μm intervals.

Figure S3. Application in the detection of glucose in solution. a, Detection of glucose in
solution using a centrifuge tube. b, Direct visible detection of glucose in the concentrations of 0, 4, 8, 12, 16, and 20 µM. c, Detection of glucose by GOx and HRP with the concentration of glucose in solution ranging from 0-20 µM with incubation for 5min.

Movie S1. Dynamic confocal Z-stack images of GOx@HRP.

Movie S2. Real time movie visualizing the dynamic transport process of 6-NBDG on GOx@HRP (recorded by confocal).

Movie S3. Real time movie visualizing the formation and diffusion of resorufin on GOx@HRP (recorded by confocal)