Chemical structures of the block copolymer and the substrates.

Chemical structure of poly(ethylene glycol)-poly(\(\alpha,\beta\)-aspartic acid) block copolymer

Chemical structure of a series of p-nitrophenyl-N-acetyl-\(\beta\)-chitooligosides as substrates
Synthesis and characterization of block copolymer.

Poly(ethylene glycol)-poly(α,β-aspartic acid) block copolymer [PEG-P(Asp)] was prepared by alkali hydrolysis of the side chain benzyl groups of poly(ethylene glycol)-poly(β-benzyl L-aspartate) block copolymer (PEG-PBLA), which was synthesized by BLA-N-carboxy anhydride polymerization initiated from the terminal primary amino group of α-methoxy-ω-amino-poly(ethylene glycol) (Mn = 12000, Mw/Mn = 1.02), which was kindly gift from Nippon Oil & Fats Co., Ltd., Japan, under argon atmosphere in DMF. The composition of the obtained PEG-PBLA was determined from $^1$H NMR measurement carried out in DMSO-$d_6$ at 80 °C. The polymerization degree of BLA units was calculated to be 15 from the peak intensity ratio of the methylene protons of PEG ($\delta=3.5$ppm) and the phenyl protons of the BLA unit ($\delta=7.3$ppm). Gel permeation chromatography (GPC) measurement was carried out in DMF with 10mM LiCl. The GPC chromatogram of the obtained PEG-PBLA was unimodal, and Mw/Mn was determined to be 1.03 using the calibration curve of PEG. The conversion of PEG-PBLA to PEG-P(Asp) was carried out using 0.5M NaOH. In order to check the degree of deprotection as well as the purity of the obtained polymer, $^1$H NMR measurement in D$_2$O was carried out. Quantitative deprotection was confirmed from the disappearance of the peaks corresponding to the benzyl group. The peaks in NMR spectrum were all assignable to corresponding protons in the structure of PEG-P(Asp).
**Experimental procedure of enzymatic activity evaluation**

1000 µmol/mL of (NAG)$_2$, 500 µmol/mL of (NAG)$_3$, and 100 µmol/mL of (NAG)$_4$ and (NAG)$_5$ solutions in sodium phosphate buffer (10mM, pH 7.4) were prepared separately as the stock solutions. PIC micelle solution prepared at stoichiometric mixing ratio, native lysozyme solution, and the above stock solutions of the substrates were separately incubated at 25 °C for 1 hour before the activity measurement. The substrate stock solution was then mixed with an equal volume of the micelle or native lysozyme solution to start enzymatic reaction. Lysozyme concentration in the final mixing solution was fixed to be 0.14 µmol/mL (2.0 mg/mL). The change in the absorbance at 400 nm due to the hydrolysis of nitrophenyl ester group of the substrate was monitored at 25 °C.