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Sorption characteristics and ion chromatographic determination of phosphate ions in aqueous media by polyurethane foam chemically immobilized with gold nanoparticles

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The present study reports the retention profile and separation of inorganic phosphate from aqueous media containing molybdate ions using gold nanoparticles (AuNPs) chemically treated polyurethane foams (PUFs) solid phase extractor. Kinetics, thermodynamic and sorption characteristics revealed excellent capacity of phosphate uptake and compared favorably with other conventional solid sorbents. Thus, AuNPs treated PUFs packed column was successfully used for deploying excellent ion chromatographic (IC) method for trace analysis of phosphate in water. The lower limit of detection (LOD) and quantification (LOQ) obtained were 0.045 and 0.15µg mL−1, respectively. A recovery percentage in the range (97%±2.5%-102%±1.2%) was successfully achieved. The method offers a simple, and sensitive system with short analytical time, coupled with good reproducibility and accuracy and it can be extended for analysis of picomolar level of phosphate in water via on-line preconcentration from large sample volumes onto PUFs packed column prior determination.

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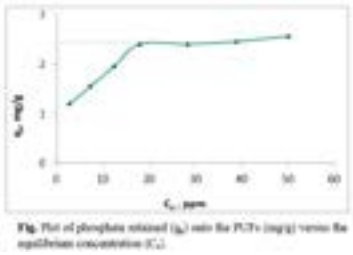

CenC, a multi-domain thermostable GH9 processive endoglucanase from *Clostridium thermocellum*: Cloning, characterization and saccharification studies

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The growing demands of bioenergy have led to the emphasis on novel cellulases to improve efficiency of biodegradation process of plant biomass. Therefore, a thermostable cellulolytic gene (*CenC*) with 3,675 bp was cloned from *Clostridium thermocellum* and over-expressed in Escherichia coli strain BL21 CodonPlus. It was attested that *CenC* belongs to glycoside hydrolase family 9 (GH9) with four binding domains, a processive endoglucanase. *CenC* was purified to homogeneity, producing a single band on SDS-PAGE corresponding to 137.11 kDa, by purification steps of heat treatment combined with ion-exchange chromatography. Purified enzyme displayed optimal activity at pH 6.0 and 70°C. *CenC* had a half-life of 24 min at 74°C, was stable up to 2 hours at 60°C and over a pH range of 5.5-7.5. Enzyme showed high affinity towards various substrates and processively released cellobiose from cellulosic substrates confirmed by using HPLC technique. It efficiently hydrolyzed carboxymethyl cellulose (30 U/mg), β-glucan Barley (94 U/mg); also showed activity towards p-nitrophenyl-β-D-cellobioside (18 U/mg), birch wood xylan (19 U/mg), beechwood xylan (17.5 U/mg), avicel (9 U/mg), Whatman filter paper (11 U/mg) and laminarin (3.3 U/mg). *CenC* exhibited K_m, V_{max}, K_{cat}, V_{max} Km^{-1} and K_{cat} Km^{-1} of 7.14 mM, 52.4 µmol mg^{-1} min^{-1}, 632.85 s^{-1}, 7.34 min-1 and 88.63, respectively used CMC as substrate. Recombinant *CenC* saccharified pretreated wheat straw and bagasse to 5.12% and 7.31%, respectively at pH 7.0 and 45°C after 2 h incubation. Its thermostability, high catalytic efficiency and independence of inhibitors make *CenC* enzyme an appropriate candidate for industrial applications and cost-effective saccharification process.

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