Summary Report of Experiments Investigating the Sorption of Phosphate onto TC-75

Prepared By

Vinka Craver, Ph.D.

and

James Smith, Ph.D.

May 12, 2005

For

George Alther

Biomin, Inc.

P. O. Box 20028

Ferndale, MI 48220

This report presents Tables and Figures summarizing the results a column experiment studying the sorptive capacity of TC-75 to an aqueous- phosphate solution. A 30-inch long (76.2 cm) by 3-inch diameter (7.62 cm) column was constructed from poly-vinyl-chloride (PVC) and filled with the sorbent material to be studied. A peristaltic pump forced an aqueous-phosphate solution containing 700 mg/L of phosphate up through the column to displace void-space air and ensure maximum contact with the sorbent material. One the column achieved the 95% of breakthrough a regeneration process was applied. The process consisted on fill the column with a solution of 3% sodium chloride and 1% sodium hydroxide over night. After that, the column was rinsed with tap water for five minutes before feed it again with the aqueous-sulfate solution.
One the column achieved the 95% of breakthrough a regeneration process was applied. Samples were collected periodically at the outflow of the column and analyzed using a HACH method.

Results in this report are presented in Tables 1 and 2 and Figure 1 and 2 as identified below:

Table 1. Sorbent mass, porosity, flow rate, and residence time for columns packed with TC-75 sorbent.

Table 2. 95% breakthrough data of TC-75 sorbent material given in pore volumes (PV), bed volumes (BV), and minutes along with estimated mass of phosphate sorbed per mass of sorbent in mg/kg, lb/lb, and percent basis.

Figure 1. Breakthrough curve (in terms of pore volume) of phosphate through a column of TC-75

Figure 2. Breakthrough curve (in terms of bed volume) of phosphate through a column of TC-75

.

Table 1. Sorbent mass, porosity, flow rate, and residence time for columns packed with TC-75 sorbent.

Sorbent	Mass Sorbent		Porosity	Flow Rate		Residence
	(kg)	(lb)		(mL/min)	(gal/hr)	(min)
TC-75	2.2	4.8	0.34	60	0.96	20

Table 2. 95% breakthrough data of TC-75 sorbent material given in pore volumes (PV), bed volumes (BV), and minutes along with estimated mass of phosphate sorbed per mass of sorbent in mg/kg, lb/lb, and percent basis.

Sorbent	Breakthrough		Mass sorbed		Mass Sorbed/Mass Sorbent		
	PV	min	(mg)	(lb)	(mg/kg)	(lb/lb)	(%by sorbent)
First 95% breakthrough	60	1200	9648	0.0212	4385	0.00439	0.439
Second 95% breakthrough	17	340	2033	0.0045	924	0.00092	0.092
Total	77	1540	11681	0.0257	5310	0.00531	0.531

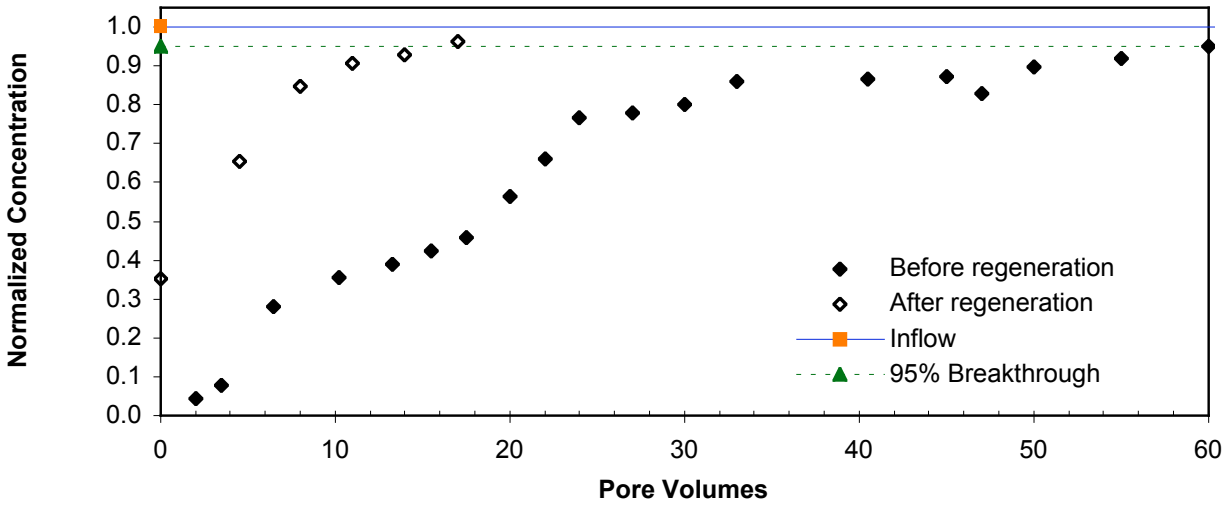

Figure 1. Breakthrough curve (in terms of pore volume) of phosphate through a column of TC-75

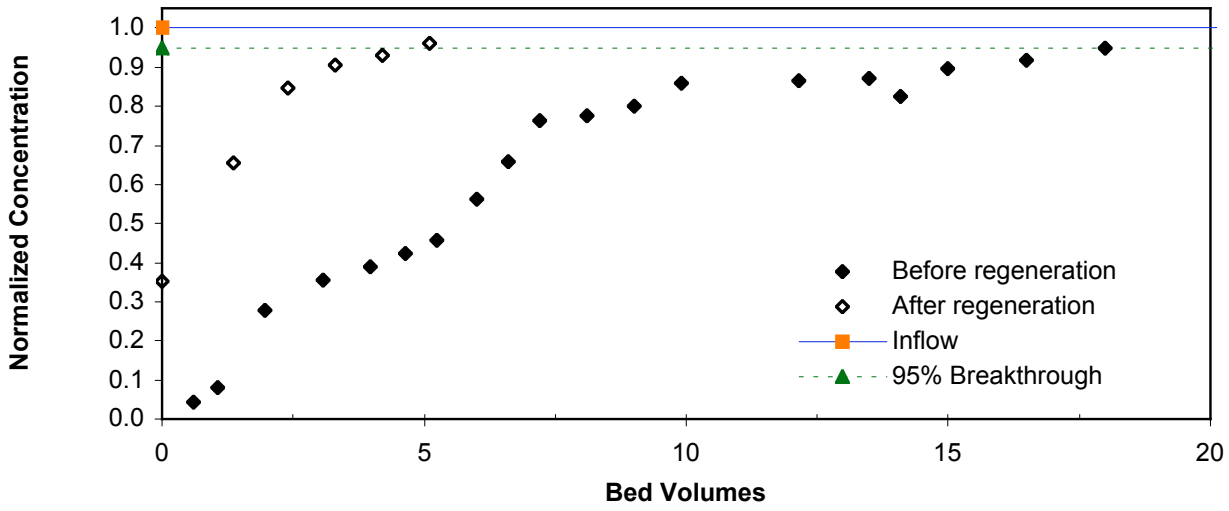

Figure 2. Breakthrough curve (in terms of bed volume) of phosphate through a column of TC-75