

CONSIDERATIONS ON DL-VALINE SORPTION OVER SOME ACTIVATED NATURAL SORBENTS

V. Lesichkov, G. Yovkov, N. Enchev

The present work is in close connexion with earlier studies by the same authors on the sorption of amino acids over acid-activated natural sorbents from North-Eastern Bulgaria (1, 2). The results thus far obtained led us to undertake a more extensive research into the problem with a view to its practical implications. There are no reports on similar studies in the pertinent literature, especially insofar as natural sorbents deriving from the geographical region mentioned above are concerned. In this respect, the works of D. P. Salc, D. Ovcharenko and N. N. Kruglitzkii (3), dealing with the practical application of natural sorbents, are worthy of interest. Pinck (4) outlines the possibility of applying chemically modified montmorillonite for the purification of proteins, enzymes and antibiotics. The trend followed in the works published by Plaeulins (5), Potter and Stollerman (6), Singer and Fraenkel—Courat (7) and They and co-authors (8) is similar.

In the study described the natural sorbent from the city of Tolbuhin, Riltzi quarter, employed for building ceramics, proved to be a prospective one. Again the maximum sorption area was investigated as suggested by preliminary researches. Acid activation with HCl, H₂SO₄ and HNO₃, conducted in accordance with the method already described (1, 2) was chosen. The concentrations of the activators were rather limited in range to the end of sorption maximum determination. Work was done with 2.5, 3, 5, 7, 10 and 12 per cent acids, at room temperature. Sorption was effected under static conditions with 5, 7 and 10 millimole solution of DL-valine. The concentration of the latter was determined photometrically, according to a personally developed method (1, 2). In this way, the results of DL-valine sorption were read in millimoles per gram sorbent. They are presented in Tables 1, 2 and 3.

It can be seen from the adsorption isotherms' course that the kinetics of the process in the various cases follows an approximately analogical regularity. In general, yet with the first application it is subordinated to Langmuir's equation. The proportionality zone is very clearly outlined (the area of Henry). The dependence of the absorbed amount on its concentration in the starting solution is also marked. A complete proportionality is recorded in the cases of H₂SO₄ and HNO₃ activation, where the displacement of isotherms corresponds to the rise of DL-valine concentration in the starting solution.

The almost equal character of the curves in the individual cases of activation points to the fact that the structure of sorbents is modified in the

same pattern, and therefore sorption under equal conditions is subordinated to the same regularity. On the whole, it is established that the maximal sorption capacity of the sorbent under study is achieved upon activation with comparatively low concentrations of the acids. In hydrochloric acid

Table 1

DL-Valine Sorption from Water Solution over Clay Activated with HCL from the City of Tolbuhin, Riltzi Quarter

HCl concentration in %	DL-valinen concentration in the starting solution in mM		
	5	7	10
Quantity of sorbed DL-valine in mM/g			
0 (crude clay)	0.038	0.055	0.210
2.5	0.100	0.193	0.382
3	0.340	0.666	1.240
5	0.362	0.690	1.440
7	0.350	0.650	1.161
10	0.183	0.588	0.963
12	0.260	0.540	0.888

Table 2

DL-Valine Sorption from Water Solutions over H₂SO₄ Activated Clay from Tolbuhin, Riltzi Quarter

H ₂ SO ₄ concentration in %	DL-valine concentration in the starting solution in mM		
	5	7	10
Quantity of sorbed DL-valine in mM/g			
0 (crude clay)	0.042	0.058	0.231
2.5	0.231	0.432	1.206
3	0.283	0.600	1.328
5	0.323	0.843	1.442
7	0.460	0.863	1.470
10	0.542	0.890	1.500
12	0.520	0.762	1.360

activation, the optimal results are obtained after treatment with 5 per cent acid, whereas in activation with sulphuric and nitric acid — after treatment with 10 per cent acids. This is quite advantageous economicalwise. In a number of studies on other natural sorbents, good results were obtained upon activation with higher concentrations of the acid solutions. Therefore, the results herein reported should be interpreted as a peculiarity of the sorbent. The data submitted here are in line with those described in previous

Table 3

DL-Valine Sorption from Water Solutions over HNO₃
Activated Clay from Tolbuhin, Riltzi Quarter

HNO ₃ concentration in %	DL-valine concentration in the starting solution in mM		
	5	7	10
Quantity of sorbed DL-valine in mM/g			
0 (crude clay)	0.040	0.062	0.193
2.5	0.423	0.573	1.340
3	0.500	0.660	1.400
5	0.600	0.795	1.490
7	0.774	0.940	1.540
10	0.800	1.100	1.562
12	0.740	0.960	1.390

works (1, 2), and in addition, the course of the absorptional isotherm upon nitric acid activation is clarified. The slight differences in our previous studies may be accepted as being accidental.

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О СОРБЦИИ DL-ВАЛИНА НА НЕКОТОРЫЕ АКТИВИРОВАННЫЕ ПРИРОДНЫЕ СОРБЕНТЫ

Вл. Лесичков, Г. Йовков, Н. Енчев

Р Е З Ю М Е

Объектом исследования является глина из города Толбухин, кв. Рилци, которая используется для производства строительной керамики. Глина активирована 2,5, 3,5, 7, 10 и 12% растворами соляной, серной и азотной кислотами. Сорбция DL-валина проведена при статических условиях и комнатной температуре из 5,7 и 10 ммол водных растворов DL-валина. Концентрация валина определена фотометрически по стандартной кривой. Полученные результаты представлены на трех таблицах.

Установлено, что кинетика сорбционного процесса в различных случаях активации происходит приблизительно по одному и тому же закону. Хорошо подчеркнута зависимость сорбированного количества от его концентрации в исходном растворе. Максимальную сорбционную способность сорбент приобретает при активировании сравнительно низкими концентрациями кислот: 5% для соляной кислоты и 10% для серной и азотной. Это считается особенностью этого природного сорбента.