Nanocomposites and nanomaterials

Nanocomposite magnetic mineral sorbents in processes of water treatment

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The water purification adsorption procedure is widely used in combination with magnetic separation, which involves the application of nanocomposite magnetic mineral sorbents [1]. The aim of this work was to create effective and cheap nanocomposite magnetic mineral sorbents for wastewater treatment from polyphosphates. Synthesis was carried by impregnating matrix of saponite, spondyle and palygorskite clay by nanomagnetite in the form of magnetic fluid [1]. In this way samples of magnetic composite sorbent on the base of clay minerals with various contents of Fe_3O_4 were received: 2 % (MS-2), 4 % (MS-4), 7 % (MS-7), 10 % (MS-10). The maximum adsorption capacities of obtained sorbents samples regarding to tripolyphosphate (TPP) and hexametaphosphate (HMP) are shown in Table 1.

Table 1 – The sorption capacity of the obtained sorbents samples

Sample	a, mg P/g				
	Saponite	MS-2-S	MS-4-S	MS-7-S	MS-10-S
TPP	20.1	42.0	45.9	48.3	43.3
HMP	14.2	31.2	36.0	41.4	37.5
Sample	Spondyle	MS-2-Sp	MS-4-Sp	MS-7-Sp	MS-10-Sp
TPP	18,3	43,0	45,3	46,4	44,7
HMP	12,6	33,6	40,1	41,0	37,2
Sample	Palygorskite	MS-2-P	MS-4-P	MS-7-P	MS-10-P
TPP	18,6	43,0	43,4	47,7	42,7
HMP	14,5	32,9	39,0	40,0	34,0

As stated in Table 1 the obtained nanocomposites have greater sorption properties with respect to polyphosphates. Through the introduction of magnetite in an amount of 2-10% wt. of the composites the maximum sorption capacity relatively polyphosphates was increased in 2-2.5 times compared to the clay minerals. Thus, the creation of nanocomposite mineral sorbents is a promising direction for water purification.

1. *Makarchuk O., Dontsova T., Astrelin I.* Magnetic Nanocomposites as Efficient Sorption Materials for Removing Dyes from Aqueous Solutions // Nanoscale Research Letters. - 2016. – **11:161**. – P. 1-7.