Alinteri J. of Agr. Sci. (2021) 36(1): 590-593
e-ISSN: 2587-2249
info@alinteridergisi.com

http://dergipark.gov.tr/alinterizbd
http://www.alinteridergisi.com/
DOI:10.47059/alinteri/V36I1/AJAS21082

RESEARCH ARTICLE

Structural Formation of Cruts of Mobile Soils and Sands from Selected Components of Fixers

Nargiza Zamirovna Adizova[1*] • Shakhnoza Abdulazizovna Kuldasheva[2] • Bobirjon Zamirovich Adizov[3] • Dildora Tulibaevna Ruzmetova[4] • Abduraxim Abduxamidovich Nabiev[5]

[1*]*Assistant, Department of Chemistry, Bukhara Engineering and Technology Institute, Republic of Uzbekistan, Bukhara, Uzbekistan. E-mail: nargiza_zamirovna@mail.ru*

[2]*Doctor of Chemistry, Chief Researcher, Laboratory of Colloid Chemistry and Industrial Ecology, Institute of General and Inorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Republic of Uzbekistan, Tashkent, Uzbekistan. E-mail: ecology.shaxnoz@mail.ru*

[3]*Doctor of Technical Sciences, Leading Researcher, Laboratory of Colloid Chemistry and Industrial Ecology, Institute of General and Inorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Republic of Uzbekistan, Tashkent, Uzbekistan. E-mail: bobirjon_adizov@mail.ru*

[4]*Senior Lecturer, Urgench State University, Urgench, Uzbekistan.*

[5]*Associate Professor, Tashkent Institute of Chemical Technology, Tashkent, Uzbekistan.*

ARTICLE INFO

Article History:
Received: 06.04.2021
Accepted: 10.05.2021
Available Online: 21.06.2021

Keywords:
Crust
Mobile Soils and Sands
Fixer
Mechanical Strength
Crystallization Structures
Coagulation Structures
Thixotropy
Associate
Meliorant

ABSTRACT

The article explains that in order to secure the mobile sands (MSa) and (MSo) soil, it is necessary to individually study their compositions and properties, as well as the possibility of their regulation through the use of effective chemical reagents and industrial waste. The study of the thickness of the crusts formed in mobile soils and sands shows that their thickness is one of the important characteristics in determining their mechanical strength and water resistance. It was revealed that structure formation in the crusts is a complex mechanochemical process for the regulation of which it is advisable to use experimentally selected compositions of fixing agents, taking into account their physicochemical properties.

Please cite this paper as follows:

Adizova, N.Z., Kuldasheva, S.A., Adizov, B.Z., Ruzmetova, D.T. and Nabiev, A.A. (2021). Structural Formation of Cruts of Mobile Soils and Sands from Selected Components of Fixers. *Alinteri Journal of Agriculture Sciences, 36*(1): 590-593. doi: 10.47059/alinteri/V36I1/AJAS21082

Introduction

In the fight against desertification and the development of desert regions, it is important to study the structure formation of crusts of mobile soil and sand from selected components of fixers.

Depending on the type and composition of the ameliorant, the processing temperature of the moving sand dispersions, structures of different nature are formed, the strength of which will change under the action.

According to P.A. Rebinder, the structures of the crusts formed in soils and sands can be classified into coagulation,

* Corresponding author: nargiza_zamirovna@mail.ru

crystallization and condensation, according to the scheme shown in Fig. 1. [1-4].

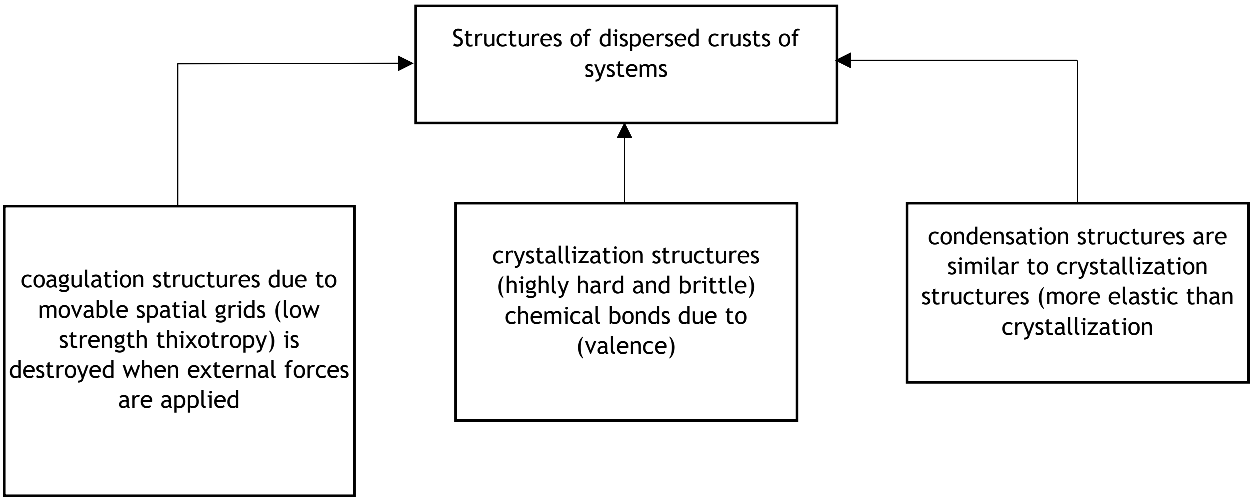


Fig. 1. Classification of structures of dispersed crusts formed with the use of selected mobile sands (MSa) and (MSo) soil fixers

Figure 1 shows that these structures differ significantly in the formation of a solid surface and their mechanical strength.

Crystallization structures are formed due to chemical bonds of major valences. In this case, crystalline "bridges" appear between the particles. The latter can consist of the substance of the particles themselves, but often arise during the crystallization of other components of the system, especially insoluble reaction products in a dispersion medium, which are concentrated in the gap between the particles. Crystallization structures are distinguished by high strength, hardness and brittleness [5].

Coagulation structures are mobile spatial grids, formation due to Van der Waals forces and separated at the points of connection by thin layers of a liquid dispersion medium. This nature of the bond determines the low strength and, at the same time, the thixotropy of these structures, i.e. when an external force is applied, the structure is destroyed, and after the removal of the force, it spontaneously recovers under the influence of thermal motion [6].

Condensation structures are similar to crystallization structures, but differ in the nature of the bonding of particles. The role of "bridges" is played by non-crystalline products of chemical reactions, for example, polycondensation products. Accordingly, condensation structures are more elastic than crystallization structures [7].

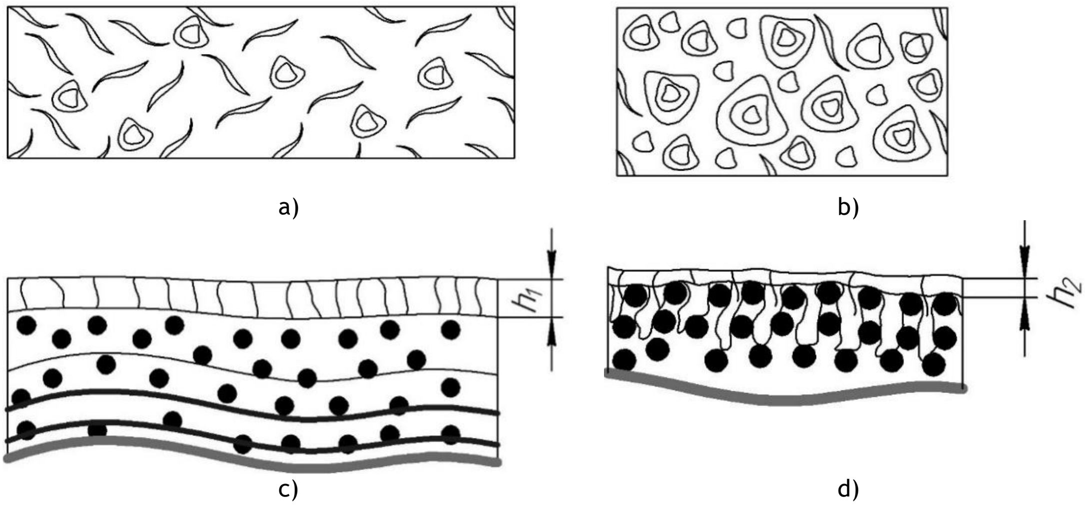
P.A. Rebinder notes that these types of structures exhaust all spatial structures of soils, binders in mortars and concretes, including soil and bituminous materials, in polymers, ceramics, glass and cermets, metals and alloys. Thus, the structure arising during the fixation, and, consequently, the chemical reclamation of mobile sands (MSa) and (MSo) soil, is entirely covered by this classification of structures.

So, the scientific basis for obtaining a coherently dispersed sand from a free-dispersed system is physicochemical mechanics, and, therefore, intermolecular interactions between the surfaces of sand particles and structural-kinetic units (ions, molecules, their associates, supramolecular structures) of solutions (or melts) of ameliorants, due to which, depending on the type of ameliorant, forms structures differing in nature and strength.

Naturally, with the surface fixing of PP with the use of one or another ameliorant, one of these structures appears. The strength of the contact between sand grains in a coherently dispersed system, and, consequently, the strength of the surface sand crust are determined by the nature of the surface of the solid phase particles, the type and degree of structuredness of the ameliorant dispersion. The kinetics of structure formation is associated with the rate of processes of interaction of ameliorants with substrates, in particular, adsorption, adhesion, etc. It follows from this that the efficiency of the undertaken measures for reclamation of mobile sands (MSa) largely depends on the size and shape of the ameliorant particles in their dispersions, possible changes in the shape and size of these particles, the concentration of the solution, the content of foreign substances present, the ionic strength of the solution, etc. The concentration of the dispersion of the ameliorant or its fluidity must ensure adhesion and cohesiveness and prevent it from spreading into the depths of the sand. The study of the processes occurring in dispersions of chemical ameliorants is important in determining the rational consumption and conditions for the implementation of activities related to the consolidation of mobile sands.

In this regard, it is necessary to investigate the physicochemical properties of the selected ameliorants, to determine the dependence of properties on concentration, temperature and pressure. The properties of solutions (suspensions) and other dispersions of chemical ameliorants are studied by a variety of methods. In this case, the most important are the microproperties of systems occurring at the molecular level.

Considering the above, we have shown dispersion crusts formed on the surfaces of mobile sands (MSa) and (MSo) soil, when using selected fixers (Fig. 2).



a and b - appearance; c and d - side view;
a and b - for mobile (MSo) soil; b and d - for mobile sands (MSa)

Fig. 2. External and lateral views of the formed crusts in mobile sands (MSa) and (MSo) soil

In Figure 2, the external views of the crust formed in the mobile sands (MSa) and (MSo) soil are presented in schemes a and b, while the lateral views of the formed crusts are shown in schemes c and d.

From the literature it was found that the thickness of the crust formed in the PP is thinner than the thickness of the crust in the mobile MSa [8-12]. This is due to the fact that more fixing ameliorant goes into the thickness of the sand than into the soil.

Based on the above, we propose the following formula to quantify the thickness of the crusts formed in mobile MSo and MSa:

$$C_y^K = \frac{h_2}{h_1}$$

where: S_u^K - the degree of change in the thickness of the crust;

h_1 - the thickness of the crust in the mobile MSo, mm;

h_2 - the thickness of the crust in the mobile MSa, mm;

given that: $h_1 \geq h_2$ and $0{,}0 < C_y^K \leq 1{,}0$.

Using this formula, we calculated the degree of change in the thickness of the crust

Table 1. Changes in the thickness of the fixed crusts depending on the composition of the mobile MSo and MSa fixers composition

Indicators of the thickness of the fixed crusts	Composition number of mobile MSo and MSa fixers							
	1	2	3	4	5	6	7	8
h_1	24,8	21,3	23,6	16,2	32,7	28,4	30,6	29,8
h_2	15,2	14,5	14,0	8,7	23,8	19,7	22,1	18,6
C^y_K	0,61	0,68	0,59	0,54	0,73	0,69	0,72	0,62

Table 1 shows that the thickness of the crusts obtained in the mobile MSo is 0.15-0.17 more than in the MSa. This is explained by the fact that components are consumed in the composition of MSa fixing by 10-15% more than in MSo.

Consequently, according to the importance of fixing the MSo and MSa, the selected components can be arranged in the following decreasing order: dispersed clay (alkaline or alkaline earth bentonite) > OF (organic fertilizer) > Na_2SiO_3 nH_2O>$Ca(OH)_2$ > $CaCO_3$ > K-4 > GR (gossypol resin)>CPHR (carbomidopharmaldehyde resin) > Uniflok > Gipan > NSh (oil sludge).

The study of the thickness of the crusts formed in mobile MSo and MSa shows that their thickness is one of the important characteristics in determining their mechanical strength and water resistance. Therefore, with a change in the nature of the dispersed medium, it is advisable to correct the composition of the fixer composition by experimentally determining their individual properties.

Conclusion

Thus, structure formation in the crusts is a complex mechanochemical process for the regulation of which it is advisable to use experimentally selected compositions of fixing agents, taking into account their physicochemical properties presented above.

References

Gavrilova N.N., and Nazarov, V.V., 2015. *Analysis of porous structure based on adsorption data: textbook.* allowance - M: RKhTU im. D.I. Mendeleeva, 132.

Sobin E.P. 2020. *Improvement of the system of metrological support of measuring instruments for porosity and permeability of solids and materials.* Diss. on sois. Doctor of Technical Sciences, according to spec. 05.11.15 - Metrology and metrological support, Yekaterinburg, 411.

Gromakov, N.S., 2015. *Disperse systems and* their *properties: Textbook on colloidal chemistry:* N.S. Gromakov. -

Kazan: Kazan Publishing House. state architect-build University, 91.

Svarovskaya, N.A., Kolesnikov, I.M., Vinokurov, V.A., 2014. *Disperse systems. Sedimentation analysis of suspensions / Methodical instructions for laboratory practice on the course "Physical and colloidal chemistry.* M: Publishing Center of the Russian State University of Oil and Gas named after I.M. Gubkina, 46.

Ivankin, A.N., 2016. *Chemistry and Biotechnology.* Tasks and solutions: tutorial. A.N. Ivankin, G.L. Oliferenko, O.P. Proshina, Yu. N. Zhilin. M: FGBOU VO MGUL, 400.

Klyndyuk, A.I., 2011. *Surface phenomena and disperse systems: textbook.* manual for students of chemical and technological specialties. - Minsk: BSTU, 317.

Sergeev, V.N., 2007. *The course of colloidal chemistry for medical universities.* Textbook for universities. - M.: Medical Information Agency. 174.

Zakharov, N.G., 2009. *Training and metodology complex. Protection of soil from erosion.* Ulyanovsk, State Agricultural Academy, 235.

Yu. N. Vodyanitsky., 2010. B62. *Iron compounds and their role in soil protection. M: GNU Soil Science Institute.* V.V. Dokuchaev Russian Agricultural Academy, Monograph, 156.

Eremchenko, O.Z., 2016. *Soils and technogenic surface formations of urbanized territories of the Perm Kama region: monograph;* Perm. state nat. issled. un-t. - Perm, 252.

Adizova, N.Z., Kuldasheva, Sh.A., Ahmadjonov, I., and Abdulxaev, T.D. 2020. Efficiency of Fixing Mobile Sands for Solving some Ecological Problems of Desert Zones of Surkhandarya. *Solid State Technology,* 63(4): 376-382.

Adizova, N.Z., Kuldasheva, Sh.A., Ahmadjonov, I., and Abdulxaev, T.D., 2019. Studying the influence of windway air flow on erosion of fixed soilds and sands of the aral. *Uzbek chemical journal,* 2: 29-35.