

# Life Origination Hydrate Theory (LOH-Theory): natural gas and niter as sources of amino-acids and proteins in the process of living matter origination

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## Abstract

Not only DNAs, but amino-acids (AAs) and proteins can be obtained from natural gas, niter and phosphate.

## 1. Introduction

We proved earlier (e.g., [1–4]) that nothing put obstacles in the way of DNA formation from niter,  $\text{CH}_4$ , and phosphate in the  $\text{CH}_4$ -hydrate honeycomb structure. Only three sets of these reactive molecules should meet together under definite conditions in any localization in order that a great number of different DNAs should be produced. The probability of such an event is increased by the fact that  $\text{CH}_4$  is localized and, thus, only two sets of molecules should enter into the first set, by the fact that Nature as if foresaw in advance such a possibility and had created a hydrate matrix to make possible formation of the non-trivial DNA structures, and by the fact that It harmonized the conditions of existence of the matrix structure with the conditions when the source substances are reactive and, thus, had prepared in advance all necessary conditions for creation, in different  $\text{CH}_4$ -hydrate localizations, of multitudes of polymer DNA molecules identical in their polymer chains and in elemental composition but different in the sequence of the arrangement of quite definite side functional groups. But how did Nature contrive to form AAs and proteins? OK, maybe, some of them could originate from  $\text{CH}_4$  and niter molecules (we will show that this is so). But what is about the S-containing AAs? Indeed, any S-containing substance represents the fourth source substance, but no “rendezvous” of four sets of different molecules in any localization is possible according to the probability theory and Boltzmann equation. However, Nature took care of this as well. Indeed, natural gas contains not only  $\text{CH}_4$  but frequently implies  $\text{H}_2\text{S}$ ,  $\text{COS}$ , and  $\text{CH}_4\text{S}$  [5] and, in our theory, only three substances should meet together to give living matter.

## 2. Could natural gas and phosphate be precursors of AAs and proteins?

We analyze here some examples showing that the answer to the question of the title of this section is positive. In the lecture, all AAs will be considered.

Let us consider the following reactions:

- (1)  $2\text{CH}_4 + 1.5\text{KNO}_3 = \text{Gly} + 1.5\text{KOH} + 0.5\text{NH}_3 + 0.5\text{O}_2$ ;
- (2)  $3\text{CH}_4 + 2\text{KNO}_3 = \text{Ala} + 2\text{KOH} + \text{NH}_3 + \text{O}_2$ ;
- (3)  $5\text{CH}_4 + 3\text{KNO}_3 = \text{Val} + 3\text{KOH} + 2\text{NH}_3 + 2\text{O}_2$ ;
- (4)  $5\text{CH}_4 + 2\text{KNO}_3 + \text{H}_2\text{S} = \text{Met} + 2\text{KOH} + \text{NH}_3 + 2\text{H}_2\text{O} + \text{H}_2$
- (5)  $4\text{CH}_4 + \text{KNO}_3 + \text{CH}_4\text{S} = \text{Met} + \text{KOH} + 4\text{H}_2$

for syntheses of glycine  $\text{H}_2\text{NCH}_2\text{COOH}$  (1), alanine  $\text{CH}_3\text{CH}(\text{NH}_2)\text{COOH}$  (2), valine  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}(\text{NH}_2)\text{COOH}$  (3), and methionine  $\text{H}_3\text{CSCH}_2\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH}$  (4) and (5).

For each of these reactions, the standard Gibbs free energy changes are negative, and for reactions (1)–(5)  $-\Delta G_j^0$  (kJ/mol) = 251.0, 200.1, 118.6, 496.6, and 95.9, respectively. These magnitudes are so high that there are no doubts that, under the conditions of the  $\text{CH}_4$ -hydrate existence, all equilibria are right-shifted. Analogous results are obtained for other AAs. The  $\Delta G_j^0$  values are calculated on the basis of [6, 7]. It is known that  $\text{CH}_4$  is capable of reacting with  $\text{NO}_3^-$ -ions at 270–290 K (Konovalov’s reaction); the process is slow but Nature is never in a hurry. We would remind to our riders one more indisputable fact, which is regarded by us as a rather important one when considering the mechanism of living matter origination: natural gas and niter is the unique pair of minerals capable of giving all organic components of DNAs and all AAs; no other such a mineral pair exists. Consider now briefly whether peptide formation from AAs proceeds with a decrease in the Gibbs free energy. Peptides can be considered as the 3D-polymers composed of AAs bound to each other with the peptide bonds (Figure) formed by  $\alpha$ -carboxyl- and  $\alpha$ -amino-groups of the adjacent amino-acidic radicals. Notice that the observations of the processes that proceed within living cells of the present organisms

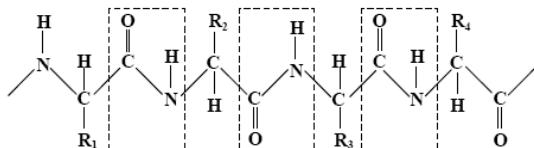


Figure: Fragment of a peptide polymer chain:  $R_i$  are radicals, and the rectangles show peptide bonds.

help us to understand the mechanism of living matter origination, because the intracellular processes have a number of common features with the processes of formation of cells in the primary super-protoplasm [8] obtained after liquation of the parental gas-hydrate structures. Proteins form through reactions of AAs polycondensation. The available thermodynamic data on the reactions of such a type are technically questionable. Therefore, we use the following simple logical consideration which shows that the reactions of such a type proceed with a decrease in the Gibbs free energy. The Gibbs free energy of any substance under any fixed conditions doesn't depend on the way of production of this substance. Let substances A and B be incapable of interacting with each other with formation of C under some conditions, i.e., the Gibbs free energy change for their problematic interaction with production of C be positive. Then, the substance C, being produced under some other conditions by any method and then being returned to the conditions under which it can't be produced, would be thermodynamically unstable and, under thermodynamic equilibrium, should transform into A and B. Meanwhile, different proteins exist really in the composition of living matter; therewith, 20 so-called proteinogenous AAs are in the protein compositions and some of them are also in the composition of protoplasm and the others are in the protein composition only. This phenomenon is observable under all conditions when living matter exists, including under underground ones similar to the conditions when original living issues had formed. This fact counts rather firmly in favor of conclusion on the negative  $\Delta_f G^0$  values for the reactions of condensation of AAs with formation of peptide bonds. The  $\Delta_f G^0$  magnitudes can be small (protoplasm contains the corresponding AAs) or rather large (protoplasm contains no corresponding AAs) depending on the specificity of the protoplasm composition, which is associated with the mitosis steps. Notice that no kinetic delay should determine the equilibrium. Indeed, it is well known that a temperature increase or an acidity change leads to protein hydrolysis; in other words, the protein-protoplasm equilibrium becomes established rather

quickly. The equilibrium is mobile, but all events of normal life processes are based on the repetitive oscillations near the equilibrium conditions, which depend on the ambient conditions and intra-cellular state. In our opinion, the primary proteins originated just through polycondensation of AAs and the above consideration is important for understanding the mechanisms of the living matter primary formation and subsequent extended reproduction.

### 3. Conclusion

Origination of AAs and proteins under the conditions, which arose after liquation of gas-hydrate systems filled with DNAs after their formation from  $CH_4$ , niter, and phosphate in  $CH_4$ -hydrate localizations, were thermodynamically possible and kinetically realizable on the basis of natural gas and niter.

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