11. COMPUTER MODELLING OF THE QUASI-CRYSTALLOID BIOPOLYMER STRUCTURE III.

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Abstract

This contribution deals with the computer modelling of a lamella composed of pentagon dodecahedrane units. The method is the following: 1. The lamella was presented and investigated by a perspective drawing. 2. Four building elements were leaved. 3. Superficial skeletal network together the points of symmetry of the edges and without network are represented. 4. Each, three kinds of points of symmetry are illustrated with skeletal network and without network. The configuration of the different kinds of points of symmetry may be useful in the interpretation of the TEM pictures of partially desintegrated superficial and lamellar biological elements.

Key words: Lamellar biological structure, computer modelling.

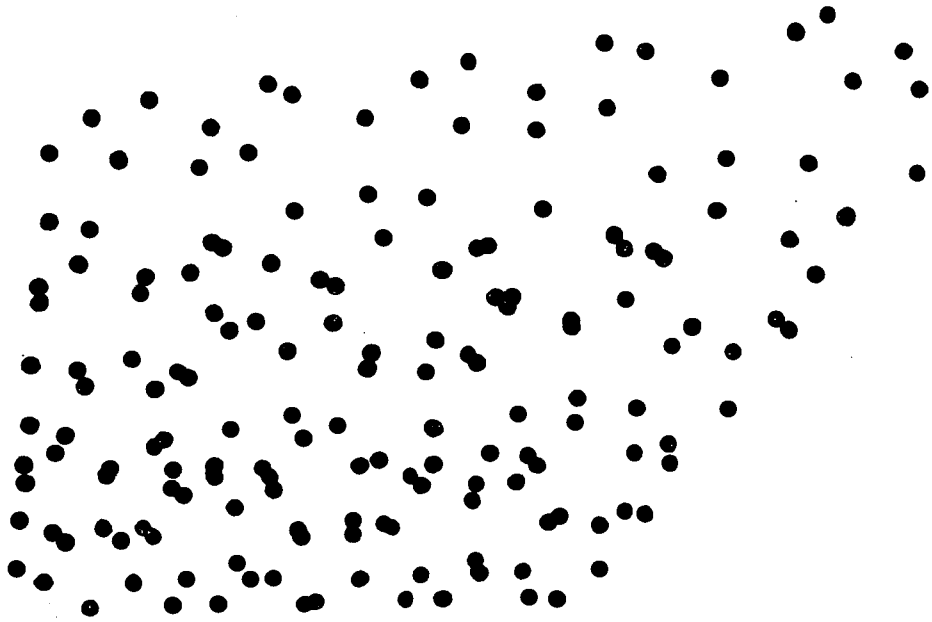
Introduction

The surfaces, and in general the bordering systems of inorganic and organic structures have their peculiarities on atomic or molecular level. Lamellar structures occur very often in several kinds of cellular elements of the living structures not only in the wall, but in the protoplasm also. The presence of the quasi-crystalloid biopolymer structure was demonstrated previously in the plant cell wall (cf. KEDVES 1988, 1989, 1990 etc.) as one kind of component of the extremely complicated molecular and biopolymer system. The aim of this contribution is to furnish computer data to the interpretation of the points of symmetry of the TEM pictures of partially degraded or dissolved biological objects.

Materials and Methods

In our previous papers (1994, 1995) we elaborated our basic methods and symbols of the computer modelling of the quasi-crystalloid biopolymer systems. We investigated the following characteristic features:

1. The superficial network and the points of symmetry of the edges of the pentagon.
2. The points of symmetry of the edges, the centrum of the planes and the centrum of the pentagon dodecahedrane elementary units.



Text-fig. 11.2.

Points of symmetry of the superficial edges of the pentagon dodecahedrane building units without network.

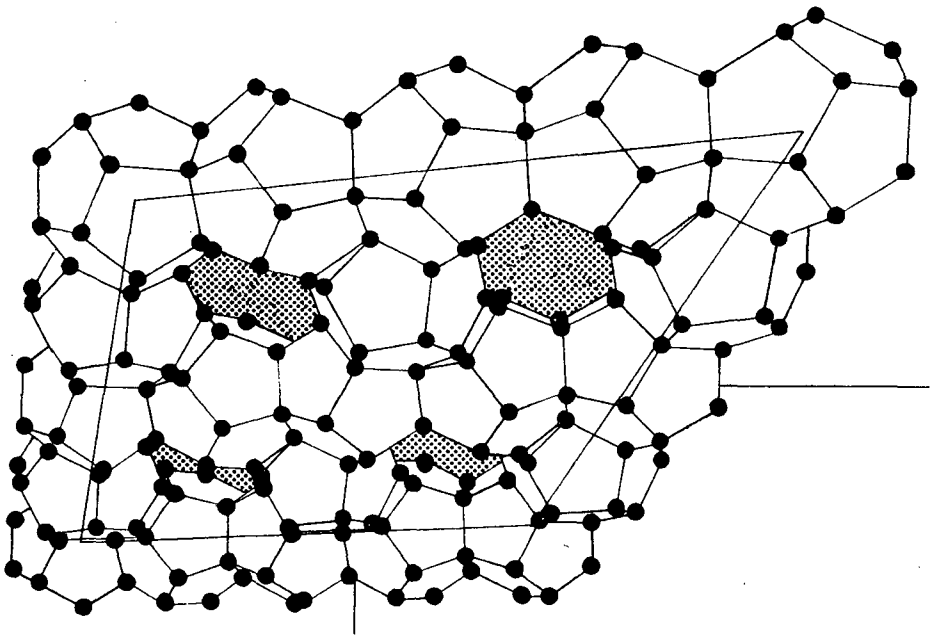
2. The computer modelling of the uni-layered lamella composed pentagon dodecahedrane elementary units.

Text-fig. 11.3. represents the quasi-crystalloid network, and each point of symmetry. Several kinds of configuration may be discernible. It is well shown that around the absent pentagon dodecahedrane units, the surrounding central stabilizing units form hexagonal patterns. The points of symmetry without network (Text-fig. 11.4.) are interesting. The holes of the leaved quasi-crystalloid units are well shown. Linear arrangement of all three kinds of points of symmetry is characteristics. And because of the great number of the points of symmetry it is extremely difficult to recognize the pentagonal arrangement of the points of symmetry. This is noteworthy in particular at the points of symmetry of the edges of the pentagonal planes.

Results

1. The superficial points of symmetry of the edges of the pentagon dodecahedrane elementary units.

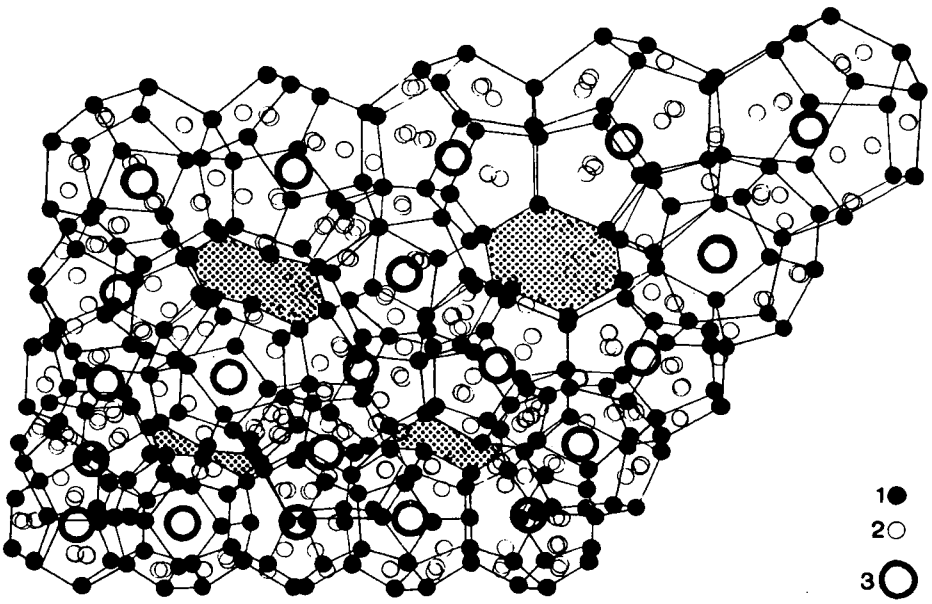
Text-fig. 11.1. illustrates the superficial network and the four leaved pentagon dodecahedrane units are dotted. The parameters of the perspective drawing are also illustrated. Without network (Text-fig. 11.2.) the points of symmetry of the superficial edges illustrate as follows. 1.1. The lack of the four superficial pentagons are not



Text-fig. 11.1.

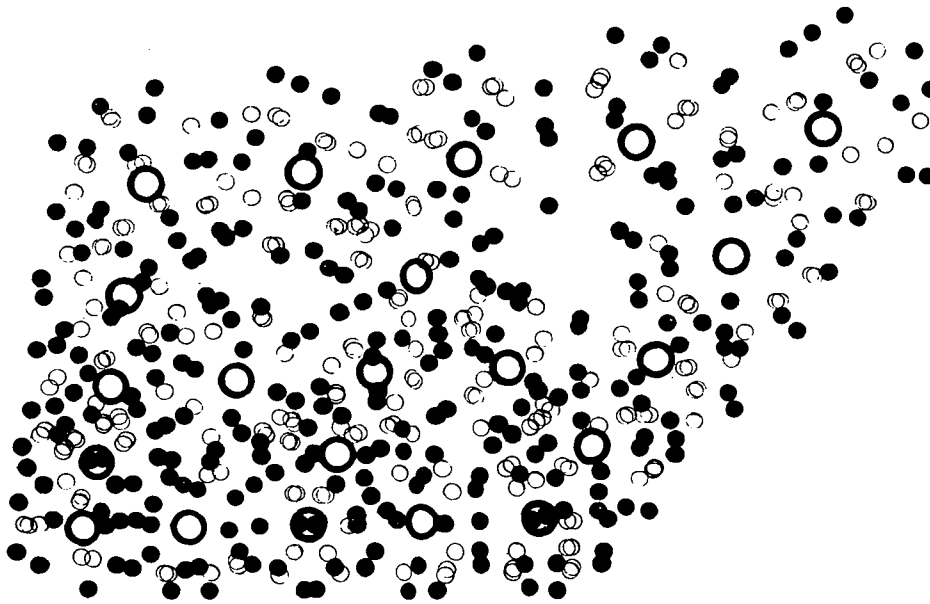
Computer model of the superficial network of the unilayered lamella represented by perspective drawing. The superficial edges of the quasi-crystalloid skeleton are illustrated. The holes of the four leaved building units are dotted.

conspicuous. 1.2. The accumulation of the points of symmetry in pairs of different kinds of triplicate may also occur in the TEM pictures of the partially degraded biopolymer systems. 1.3. The pentagons of the planes of the quasi-crystalloid skeleton, in consequence of the extremely different orientations are not always discernible. Apparently tetragons and hexagons may also occur.



Text-fig. 11.3.

Computer model of the unilayered lamella composed of pentagon dodecahedrane building elements. Legends: 1 – points of symmetry of the edges of the pentagon dodecahedrane unit. 2. The centres of the regular pentagon planes. 3. The centrum of the pentagon dodecahedrane unit.



Text-fig. 11.4.

Points of symmetry of the previous text-fig. without network.

Discussion and Conclusions

Based on our up-to-date knowledge we can establish the following:

1. The computer modelling together with the previously applied different kinds of two and three-dimensional modelling of the biopolymer systems of the plant cell wall furnish by and by more information to the interpretation of the TEM pictures of the partially degraded biological objects.

2. In this moment the methods of the computer modelling, including the different kinds of presentations need no supplementary alterations or modifications. The complete representations of the points of symmetry, including the network proved to be necessary. But the points of symmetry without network seem to have a peculiar importance in the interpretation of the points of symmetry of the TEM pictures of the partially degraded biological objects. The results presented here in probably contributed to a better understanding of the very complicated biopolymer structures.

Acknowledgements

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