

Thermodynamic properties of hevein

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Rubber latex *Hevea brasiliensis*. Credit: Lobachevsky University

Hevein is a small protein (4.7 kDa) consisting of forty-three amino acid residues. It is the main component of the bottom fraction of rubber tree (*Hevea brasiliensis*) latex that has a pronounced antimicrobial activity, thus attracting researchers' attention.

Antimicrobial peptides have a wide spectrum of action: they are capable of killing [target cells](#) quickly. Moreover, there is no resistance to this

group of substances: unlike traditional antibiotics, they do not cause the formation of resistant pathogens. All of the above makes hevein a very promising subject for research and practical use when creating sustainable forms of agricultural plants and developing new medicines.

A group of researchers headed by Professor Alexander Knyazev at the Lobachevsky University Faculty of Chemistry has been studying the thermodynamic and structural properties of biologically active substances, such as vitamins, hormones, proteins, neurostimulants, etc., for several years.

"We have analyzed by ion spray [mass spectrometry](#) a unique sample of hevein obtained at the University of Padjadjaran (Indonesia). The amino acid composition and amino acid sequence of this compound were determined using an amino acid analyzer and a [protein](#) sequencer," says Professor Knyazev.

It was established that the sample under investigation was a pure, monophasic product containing three components at a ratio of 8:1:1 with molecular weights of 4727.13 g/mol (hevein), 4620.96 g/mol (pseudo-hevein) and 4709.11 g/mol (modified hevein). When studying the properties of the sample at Lobachevsky University by the method of adiabatic vacuum calorimetry, its heat capacity versus temperature in the range from 5 K to 344 K was determined.

It was also established that the test substance has a phase transition at $T_{tr} = 222.8$ K, due to a change in the position of the protein molecules relative to each other. Based on diffraction studies, a transition mechanism was proposed.

"The aim of this work was primarily to study the properties of proteins that can potentially be used in the development of new medicines, continues Alexander Knyazev. - It was found during our research that

this sample of hevein has a phase transition at a certain temperature. Such studies are interesting because a particular modification may be responsible for a specific property that may not manifest itself in any other form."

The thermodynamic properties of proteins and other biologically active substances have a vast scope of application, one of important areas being the development of new drugs. Thermodynamic description of reactions involving proteins will shed light on the understanding of many processes that occur in living organisms, will help to answer questions about the possibility or impossibility of certain reactions and will provide insights into these proteins' biological functions.

More information: A.V. Knyazev et al, Comprehensive thermodynamic and structural study of hevein, *The Journal of Chemical Thermodynamics* (2018). [DOI: 10.1016/j.jct.2018.10.034](https://doi.org/10.1016/j.jct.2018.10.034)

Provided by Lobachevsky University

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