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C H R O N I C L E

REPORT

27-th Winter School on Molecular and Quantum Acoustics in Ustroń, Beskidy Mountains, organized by the Upper Silesian Division of the Polish Acoustical Society located in Gliwice at the Institute of Physics, Silesian Technical University

The 27-th Winter School on Molecular Acoustics took place from 23 February to 28 February 1998 in Ustroń–Zawodzie, Beskidy Mountains, at Hotel "Muflon", approximately 1.5 hour of car ride from Gliwice in the south-east direction.

The conference was a forum for all disciplines of acoustics, where molecular and quantum methods were applied, especially quantum and molecular acoustics, acoustooptics and photoacoustics, solid states acoustics and related fields. During the conference the 3-rd Workshop on Photoacoustics and Photothermics as a part of the School was performed.

The scientific program was divided into invited lectures and plenary lectures. Time of presentation for invited lectures was equal to 45 minutes and time of presentation for plenary lectures was declared by the participants but in most cases was no longer than 20 minutes. The language of the Conference was Polish and English.

There were two or three sessions every day. Five plenary lectures, each one started at 2:00 p.m., began scientific meetings every day. The conference topics were divided into eleven groups: meolecular acoustics, surface acoustics waves, ultrasonic materials, acoustics in medicine (for the first time), ultrasonic sources, magnetoacoustics, sensors, acoustics emission, photothermics, acoustooptics and photoacoustics. The invited lectures were also as follows:

1) "Ultrasonic velocities in the $Fe_{73.5}Cu_1W_3Si_{15.5}B_7$ metallic glass strips" by prof. Zbigniew Kaczkowski from the Institute of Physics, Polish Academy of Sciences, Warsaw, Poland,

2) "MR spectroscopy and imaging of periodical spin displacements" by prof. Czesław Lewa from the Institute of Experimental Physics, Gdańsk University, Poland,

3) "Fiber optic sensors with distributed sensitivity" by prof. Mieczysław Szustakowski from the Institute of Optoelectronic, Military University of Technology, Warsaw, Poland,

4) "Neural networks in medicine and signal processing — problems, applications, solutions" by dr. Thomas Fritsch from BRAIN, Sommerhausen, Germany,

5) "Electrostrictive properties of piezoceramic sensors" by prof. Zygmunt Surowiak from the Institute of Engineering Problems, Silesian University, Sosnowiec, Poland.

Most of the topics from molecular acoustics sessions provided informations about acoustics of liquids, especially acoustic spectroscopy of Kneser liquids, high pressure acoustic, spectroscopy (90 MPa), magnetic liquids, plant oils and ultrasonic investigation of self-association processes.

Basic data

- number of scientific participants – 89,
- total number of the participants – 103,
- number of declared lectures – 59,
- number of delivered lectures – 51.

It was an old tradition of our Conference that scientific program starts at 2 p.m. This gave occasion to practice sport and recreation at the beginning of a day. Unfortunately there was no snow this year. The Spring whether gave us a lot of warm. The second consequences of the Conference tradition were night sessions starting at 7.30 p.m. It was a consequence of a very large number of the lectures. Organizeres are hope that this situation will repeat when 28-th Winter School will take place next year. Of course this remark concerns riches of a scientific program not the Spring whether in February.

Full lectures texts from the Conference, after acceptance by reviewers, will be published in the 19 volume of the Molecular and Quantum Acoustics, the Journal published annually by the Upper Silesian Division of the Polish Acoustical Society. Editorial Board are strongly invite other manuscripts for publication, not strinctly connected with the School.

The Winter School on Molecular and Quantum Acoustics is the best place for all scientific efforts concerning molecular acoustics and related fields. We are waiting for new contributions for the next year meeting.

in the name of the Organizing Committee

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DISSERTATIONS

"The Methods of Measurements and Analysis of the Acoustic Emission Signal" dissertation of Zbigniew Ranachowski, D.Sc was held on March, 6-th, 1998 at Cracow University of Mining and Metallergy. The publication of the dissertation in physical acoustics was supervised by Professor Ignacy Malecki. The habilitation is employed as a head of the laboratory in the Institute of Fundamental Technological Rasearch in Warsaw.

In the dissertation the author discussed the results of his ten-year's work on acoustic emission measurements. The first chapter of the work included the definition of the Acoustic Emission (stress wave propagation effect) and the evolution of the application of the discussed method within the recent fifty years. The author of the dissertation has designed most of the analysers to register the Acoustic Emission which are presently at use in Poland.

The second chapter of the dissertation included the theoretical basis of the generation of the Acoustic Emission signals and the definitions of the descriptors used to classify the measured signals. The application of the model sources of the signal was also discussed. The third chapter was dedicated to the presentation of more complex procedures to handle the feature vectors derived from the measured signal. As the most efficient method, the neural network classification was mentioned. Using the latter method the author was able to register the Acoustic Emission signals generated by the different material effects. In the next chapter the results of the practical measurements of the Acoustic Emission measurements, done by the author, was presented. The examples described were made in concrete, ceramics, steel, composites and the detergent foams.

The following part of the dissertation included the description of the instrumentation and the test results obtained in the measurements of Evoked Otoacoustic Emissions. These experiments were made by the author in cooperation with ENT Clinic, Warsaw Medical Academy.

In the conclusion different methods of the Acoustic Emission signal processing were compared in relation to their application possibilities regarding to the object size and the applied mechanical load.

The references contained 102 papers on Acoustic Emission measurements whereas nearly the half of them were the descriptions of the experiments done by Polish authors.

Perception of modulation of single components in harmonic multitone [in Polish]
by MAURYCY J. KIN,
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29 April 1998
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Supervisor Andrzej B. Dobrucki

This thesis deals with the perception of amplitude, frequency and mixed modulation of single partials in harmonic multitones containing three, five and nine components. The experiments were provided for two exposure levels (40 and 60 phones) at the two listening conditions (headphones and electrostatical loudspeaker). Ten subjects with normal, good hearing participated at listening tests. The results of experiments indicate that there is no significant influence of exposure level and number of components on the perception of AM, FM and MM for single partials. However, perception of modulation goes in different ways for AM, FM and MM, and depends significantly on the particular partials. It means that two independent mechanisms exist at the process of perception: one is responsible for AM, and the second – for FM what confirmed Coninx's model of perception of modulation. The other interesting fact resulting from this experimental work is that the threshold values of AM and FM perception are ten times lower at the listening via loudspeaker in comparison to listening via headphones. It means that the impressions obtained for one-ear listening can not be simply added for prediction of impression at monoaural hearing in a room. Results indicate also that there is no particular weighting for AM perception for all partials at low modulating frequencies. It means that the changes of single components are perceived at the same level. For FM at low modulating frequencies, the new psychological phenomenon has been discovered for the second harmonic – the masking in pitch domain. The pitch impression of the fundamental frequency is very strong, so the pitch changes of the second harmonic, when we want to make them audible, must be grater than for other components. At higher modulating frequencies, for both, AM and FM perception, the perceptual grouping mechanisms plays an important role, what is connected to spectral theory of hearing.

Analysis of acoustic emission signal of the temporomandibular joint for diagnostic purposes [in Polish]
by Waldemar Lis,
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Supervisor R. Salamon

The objective of the work was to prove that the application of a new type of acoustic vibration sensor, a device measuring the deflection of the jaw and modern methods of processing and illustrating signals in an acoustic research system of the temporomadibular joint make diagnosing and tracking of the treatment process easier.

The work contains a description of the built system with special emphasis on the acoustic vibration sensor. This sensor – a broad band array operating by definition in unusual conditions of an acoustic interface with the human body – was designed in its origin on the basis of a layered model. The design and analysis of the transducer was conducted using difference equations which described the adopted model. The correctness of the design was verified by tests and measurements of the built transducer.

Further on the work contains a description of the methods of signal analysis that were used in the system. These methods are based on the time and frequency analysis in a mobile weighted window whose location is correlated by the jaw deflection. The paper shows results obtained in "fft" type analysis , "wavelet" type analysis and linear prediction of frequencies. Next the results of statistical studies are presented pertaining to a series of patients using the built model. These results were used to select the parameters of the acoustic signal emitted by the examined temporomadibular joint that provide proof of its pathological condition. Various forms of illustrating acoustic signals are shown to be used depending on subjective requirements.