SOCIETY OF ACOUSTICS
(SINGAPORE)

E-Newsletter
March 2020 issue

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I. CONFERENCE NEWS

The 26th International Congress on Sound and Vibration(ICSV27) will be held in Prague, Czech Republic from 11 to 15 July 2020.

Woon Siong Gan will be organising three structured sessions on:

1. Nonlinear acoustics and vibration
2. Acoustic metamaterials & phononic crystals: fundamentals and applications
3. Sound propagation in curvilinear spacetime

Please visit www.icsv27.org for more informations.

I. CONFERENCE NEWS

be organised on 29 April 2020 as part of the activities of the Internaitonal Year of Sound 2020(IYS 2020) will be postponed till August 2020, with the exact date to be announced later.

II. ANNOUNCEMENTS

The Society of Acoustics will be sending out invoices to members with outstanding membership subscriptions. Members are encouraged to make payment in support of the Society.

The E-Newsletters will be made available to industrial contacts in an effort to promote the activities of the Society.

The Society is also exploring the possibility of organising talks and other professional events in collaboration with acoustic societies of other countries.

II. ANNOUNCEMENTS

Membership Certificates will soon be made available to all members who had made full payments of membership dues

The Society aims to increase membership by inviting all persons, including those from the institution of higher learning and other related societies such as the Institute of Architects, Singapore and the members of the mechanical engineering division of the Institution of Engineers, Singapore who are qualified in the various field of Acoustics to join our Society.

We are especially keen to invite students to join our society and we are establishing the Youth Chapter soon.

III. MEMBER'S NEW ADDRESS

Please note that Acoustical Laboratory Pte Ltd has moved to the following new address:

WE HAVE MOVED

TO OUR NEW OFFICE AT

318 Tanglin Road, #01-56, Phoenix Park Campus,

Singapore 247979.

OUR CONTACT NUMBERS REMAIN UNCHANGED.

Tel: (65) 6465 6212 Fax: (65) 6465 6223

Email: enquiry@aclab.sg Website: www.aclab.sg

IV. MEMBERSHIP SUBSCRIPTION

- Fellow S$70
- Member S$50
- Associate S$30
- Student S$15
- Corporate S$200

FEE BASED ON ANNUAL RATE

FOR MORE INFORMATION PLEASE CONTACT: Dr. Woon Siong Gan at email: wsgan5@gmail.com

Membership application forms can be downloaded from the society website: www.acousticssingapore.com. Please complete and email to wsgan5@gmail.com

V. ARTICLE

The following paper will be presented by Woon Siong Gan at the ICSV27,Montreal, 12-16 July 2020.

TOWARDS BREAKING THE SONOLUMINESCENCE CODE-PHASE TRANSITION AND CHEMILUMINESCENCE

Woon Siong Gan
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V. ARTICLE

Sonoluminescence can be interpreted as a two stages process. Stage one is the second order phase transition of vapour into liquid when gas bubble breaks up and turns into liquid releasing tremendous amount of heat. This was treated in one of my previous papers. There is the singularity behaviour of the heat capacity. The second stage is the subsequent light emission due to chemiluminescence. The tremendous heat energy will enhance chemiluminescence. There is the conversion of heat energy into light energy. The treatment of chemiluminescence is by Hamiltonian describing the water molecules interaction. During the electronic state of transition, there is back to ground state when light emission occurs due to the additional mass. In any chemical reaction, the reactant atoms, molecules, or ions collide with each other, interacting to form what is called a transition state.

V. ARTICLE

From the transition state, the products are formed. The transition state is when enthalpy is at its maximum with the products generally having less energy than the reactants. In chemical reaction, that releases energy as heat, the vibrational state of the product is excited. A similar process occurs in chemiluminescence except it is the electrons that became excited. The excited state is the transition state or intermediate state. When excited electrons return to the ground state, the energy is released as a photon or light. The decay to the ground state can occur through an allowed transition(quick release of light or fluorescence).

Keywords: phase transition, singularity, chemiluminescence.

1. Introduction

Although sonoluminescence was discovered more than eight years ago, it is still unexplained . Today there is a general consensus that it is phase transition. It can be interpreted as a two –stages process. The first stage is the phase transition from the vapour phase into the liquid phase when the gas bubble breaks up and and turns into liquid, releasing tremendous amount of heat. There are several groups which considered this as a first order phase transition. In one of my previous papers[1] I considered this as a second order phase transition instead due it possess the nature of a second order phase transition due to the strong focussing of heat and the tremendous increase in the hear capacity which is a singularity of the transport property and is a characteristics of second order phase transition.

1. Introduction

Sonoluminescence, the transduction of sound into light is a phenomenon that pushes fluid mechanics beyond its limit. An initial state with long wavelength and low Mach no., such as is realized for a gas bubble driven by an audible sound field spontaneously focuses the energy density[2] so as to generate supersonic motion and a different phase of matter from which are then emitted picoseconds flashes of broadband UV light. Although the most rational picture of SL involves the creation of a “cold” dense plasma ,an imploding shockwave, neither imploding shock wave nor the plasma has been observed. Attempts to attack SL from the perspective of continuum mechanics have led to interesting issues related to bubble shape oscillation, shock instabilities and shock propagation through nonideal media and chemical hydrodynamics.

1. Introduction

The limits of energy focusing that can be achieved from collapsing bubbles in the faroff equilibrium motion of fluids have yet to be determined either experimentally or theoretically. Sonoluminescence is a paradigm of transdiscipline physics. Low amplitude sound energy entering a fluid spontaneously focuses by 12 orders of magnitude to create a flash of light and a new phase of matter. The degree to which the energy density of a continuous system can concentrate in off equilibrium motion has not been determined by theory. Additional examples of processes that concentrate energy density include tribo-electrification where the power applied to peel tape is efficiently transduced into a flux of x ray photons that can image in a few sounds and ferroelectricity where heating a crystal by C generates nuclear fusion in a deuterated environment

1. Introduction

There are some groups which argue that the tremendous heat generated during the bubble collapse can be a form of sonic fusion. Personally I feel that this is not feasible due to the fact that sofar the highest temperature achieved is only 20,000 degree kelvin. This is several orders of magnitude below the one million degrees kelvin required for fusion.

2. Second order phase transition

Spontaneous focusing involves spontaneous process which is an important concept and the following is an explanation of its meaning: A spontaneous process is the time-evolution of a system in which it releases free energy (usually as heat) and moves to a lower, more thermodynamically stable energy state. Depending on the nature of the process, the free energy is determined differently. For instance, the Gibbs free energy is used when considering processes that occur under constant pressure and temperature conditions whereas the Helmholtz free energy is used when considering processes that occur under constant volume and temperature conditions. A spontaneous process is capable of if aproceeding in a given direction, without needing to be driven by an outside source of energy.

3. Chemiluminescence explanation of light emission instead of bremsstrahlung

. There are theories arguing that the light emisssion during sonoluminescence is due to bremsstrahlung. I feel that this is incorrect because bremsstrahlung is due to electromagnetic radiation produced by the deflection of an electron by another charged particle such as an electron by an atomic nucleus. The moving particle loses kinetic energy which is converted into radiation, that is a photon to satisfy the law of conservation of energy. This is the propagation of electromagnetic waves. For sonoluminescence, we have ultrasonic waves in the background and not electromagnetic waves . Hence the light emission cannot be due to bremsstrahlung. In this paper I will follow the argument of sonoluminescence.

3. Chemiluminescence explanation of light emission instead of bremsstrahlung

Chemiluminescence provides the detailed mechanism of phase transition. The interaction of free electrons with ionized atoms is governed by the nonlinear interaction term in the Hamiltonian of the system which in this case is the Poynting vector. Here we extend the Poynting vector from first order effect to second order effect to take account of the interaction of the free electrons with ionized atoms. This nonlinear interaction gives rise to the broken symmetry of the ground state of the Hamiltonian. Broken symmetry enables the Poynting vector to be lining up in one direction resulting in the spontaneous focusing of heat. Thus we can explain that the broken symmetry combines with spontaneous focusing of heat to produce SSB. Usually spontaneous focusing also gives rise to SSB. A classical example is the conversion of water into ice. Water conversion to ice is a spontaneous process because ice is more stable since it is of lower energy and it is also a phase transition.

3. Chemiluminescence explanation of light emission instead of bremsstrahlung

Any form of crystallization is an example of SSB. Water is statistically isotropic in 3 directions in its liquid form. But as soon as ice begins to form, the molecules must give up their carefree ways and choose some very specific concentration. This is symmetry breaking. So symmetry breaking with spontaneous process gives rise to SSB.

Chemiluminescence is defined as light emitted as the result of a chemical reaction. Light is not necessary the only form of energy released by a chemiluminescence. Heat may also be provided.

3. Chemiluminescence explanation of light emission instead of bremsstrahlung

In any chemical reaction, the reactant atoms,molecules or ions collide with each other, interacting to form what is called a transition state. From the transition state, the products are formed. The transition state is where enthalpy is at its maximum,with the products generated having less energy than the reactants. In other words, a chemical reaction occurs because it increases the stability/decreases the energy of the molecules. In chemical reaction, that releases energy as heat, the vibrational sate of the product is excited. The energy dispenses through the product, making it warmer. A similar process occurs in chemiluminescence except it is the electron that becomes excited. The excited state is the transition state or intermediate state . When excited electron returns to the ground state, the energy is released as a photon. The decay to the ground state can occur through an allowed transition or a forbidden transition.

3. Chemiluminescence explanation of light emission instead of bremsstrahlung

Theoretically each molecule participating in a reaction releases one photon of light. Adding a catalyst can increase the brightness of many reactions. In chemiluminescence, the energy that leads to electronic excitation comes from a chemical reaction.

It is useful to notice that the tremendous release of heat during the bubble collapse will enhance the chemiluminescence.

4. Quantum mechanical treatment of chemiluminescence

The quantum mechanical treatment of chemiluminescencd is a quantum mechanical explanation of intermolecular interaction. In natural sciences, an intermolecular force is an attraction between tow molecules or atoms. Hydrogen bonding, dipole-dipole interactions and London (Van der Waals) forces are most naturally accounted for by Rayleigh-Schrodinger perturbation theory(RS-PT). In this theory, applied to two monomers A and B-one uses as unperturbed Hamiltonians, the sum of two monomer Hamiltonians , $H^0 = H^A + H^B$. In the present case, the unperturbed states are products $\Phi_n^A \Phi_m^B$ with $H^A \Phi_n^A = E_n^A \Phi_n^A$ and $H^B \Phi_m^B = E_m^B \Phi_m^B$.

4. Quantum mechanical treatment of chemiluminescence

- The monomer functions Φ_n^A and Φ_m^B are antisymmetric under pefrmutation of electron coordinates but the product states are not antisymmetric under intermoluculad exchange of the electrons. In the late 1960s the Eisenschitz-London approach[6] was revived and different rigorous variants of symmetry adapted perturbation theory were developed. Symmetry here means perturbational symmetry of electrons. These approaches were very difficult to apply in practice. Here a less rigorous approach of using weak symmetry forcing was introduced by applying ordinary RS-PT and introducing the intermolecular antisymmetrizer at appropriate places in the RS-PT equation. This approach leads to feasible equations, and when electronically correlated monomer functions are used, weak symmetry focusing is known to give reliable results.[7,8].

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VI. PRODUCT FROM OUR MEMBERS

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Next level transparent acoustic curtain fabrics

Soft, supple and with a natural look and feel

Our specialist knowledge and innovations in weaving techniques have produced next level transparent acoustic curtain fabrics. Tay and Tinos are soft, extremely supple fabrics with a high sound absorption level (alphaw 0.6). They show how functionality and aesthetics can go hand in hand. Swan is the new floor-to-ceiling transparent basic. The three new fabrics are of the highest technical and functional quality. We develop and produce them in our own weaving mill.

Tay: floor-to-ceiling, acoustic and transparent

Tay, a floor-to-ceiling curtain fabric, is soft, friendly and has an organic longitudinal stripe. The fabric was inspired by natural shapes in wood, bamboo and water. Tay is an extremely supple floor-to-ceiling curtain with a high sound absorption level (alphaw 0.6). It can be washed up to 70°C and is broadly applicable thanks to its 12 natural colours.

request a free sample of Tay

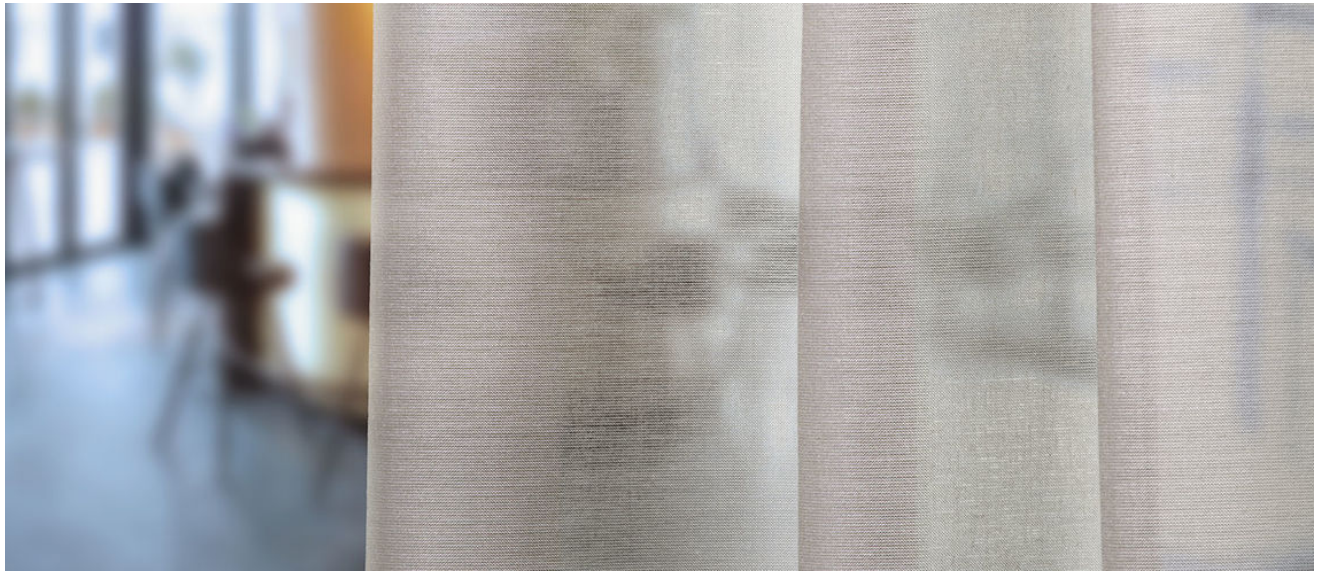
Tinos: acoustic, semi-transparent and matte

Tinos has a refined textile feel and a matte look. The vertical crêpe effect gives the fabric a natural look. Tinos is ideal for creating privacy in office environments, for example, because the fabric is semi-transparent. Just like Tay, this fabric has a high sound absorption level (alphaw 0.6), is supple and can be washed at 70°C. The 16 soft colours, including copper, silver, emerald and lilac, can easily be combined with Barkley design wallcovering.

[request a free sample of Tinos]

Swan: transparent basic with soft cotton look and feel

Swan, a floor-to-ceiling curtain fabric, is widely applicable in healthcare, office and hospitality environments thanks to its simplicity. This transparent basic has a friendly, soft cotton look. The irregular slub effect gives the fabric a natural look. The colour range consists of many naturals, including creamy white, beige and warm grey.



transparent curtain fabrics collection

Vescom’s transparent curtain fabric collection contains countless fabrics, ranging from subtle neutrals to unique accents and refined metallics. The fabrics offer a functional solution for every interior. They are fire-resistant, safe, lightfast, colourfast, functional, durable and washable at high temperatures. All fabrics are Oeko-Tex certified. In addition, there is a broad selection of transparent acoustic curtain fabrics.

request a free sample of Swan

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VI. ACOUSTICAL NEWS

The International Commission for Acoustics(ICA)has announced that 2020 to be the International Year of Sound (IYS 2020) and recommending activities around the world for this event. I strongly advise our society members to recommend what sort of activities they would like for the IYS 2020. They can email them to me to: wsgan5@gmail.com

VI. ACOUSTICAL NEWS

Importance of Sound for Society and the World

www.sound2020.org

The board of the ICA is delighted to announce that the International Year of Sound 2020 will be formally opened on Friday 31 January 2020 at the
Grand Amphitheatre Sorbonne University, Paris.

Overview plan

The ICA and La Semaine du Son (LSdS) have signed a Memorandum of Understanding and will cooperate to achieve international recognition of the goals of UNESCO Resolution 39 C/49 25 September 2017 on “The Importance of Sound in Today’s World: Promoting Best Practices” in the framework of the International Year of Sound 2020 (IYS 2020).

The IYS 2020 will comprise activities organised centrally by ICA, activities organized by La Semaine du Son and activities organized by the ICA Member Societies and International Affiliates. In this respect, the ICA is mobilizing its Member Societies and International Affiliates to arrange activities during 2020 that will promote best practices in sound.

ICA Central Activities

These will include at least:

- Official Opening on 31 January 2020.
- Production of a Video highlighting the importance of sound in all aspects of life. The video will be
- An International student competition on the importance of sound.
- Organization of Special thematic sessions in major International Conferences to be held in 2020.
- Hosting of the website www.sound2020.org
- Promoting member activities
- Creating a record of the activities These activities will be financially covered by the ICA budget and by sponsorship.

ICA Member Activities

ICA Member organisations are encouraged to host activities that highlight the importance of sound in our world and will promote best practices in sound.These activities may include National Conferences on Acoustics, thematic conferences and workshops related to sound, seminars, concerts and special events addressed to the public, and involvement of the media.The details of the outreach activity will be posted on the IYS 2020 website. The logo for IYS 2020 can then be used in the promotion and a short report will be provided as a record of that event.

These activities will be financially covered by

the Member’s budget

La Semaine du Son Activities

LSdS hosts weeks of sound throughout France as well as Belgium, Argentina and is expanding to other countries such as Lebanon and Japan. During 2020 these will be recorded as contributions to meet the goals of the IYS 2020 as well as the UNESCO

Resolution 39 C/49.More information on LSdS from www.sound2020.org

Founding Supporters

We are particularly grateful to our Founding Supporters (ASA, I-INCE, IIAV, EAA) who provided some seed funding which combined with ICA funding provided the necessary support to reach this stage.

Sponsorship

To reach our goal for the centrally funded activities sponsorship is required. Sponsors will receive extensive coverage from the website and from the centrally organised and nationally organised activities.

Sponsorship prospectus is available from www.sound2020.org

Sponsorship

ICA EVENTS at a glance

HOST WEBSITE www.sound2020.org

OPENING 31JANUARY IN PARIS

VIDEO ON IMPORTANCE OF SOUND

INTERNATIONAL STUDENT COMPETITION

PROMOTE NATIONAL EVENTS

PROVIDE REPORT ON ALL ACTIVITIES

ICA MEMBER ORGANISATIONS

PLAN YOUR IYS 2020 EVENT

OUTREACH TO HIGHLIGHT

IMPORTANCE OF SOUND AND PROMOTE BEST PRACTICES

POST THE DETAILS OF EVENT ON www.sound2020.org

RECEIVE THE IYS2020 LOGO
PLUS GOLD SPONSOR LOGO
HOLD THE EVENT
PROVIDE SHORT REPORT

The road map to the IYS 2020

It has taken considerable time to get this stage. In 2011 the ICA Board agreed to the concept of an International Year of Sound to be declared before the end of the decade. This was endorsed at the General Assembly in 2013. We spent some time following the same path as for the International Year of Light by seeking UNESCO and ultimately the UN approval. For various reasons that pathway became unachievable so in 2018 we established an agreement with the organisers of La Semaine du Son (LSdS) to work collaboratively to arrange an International Year of Sound in 2020. LSdS had been the primary force behind the UNESCO Resolution 39 C/49 25 September 2017 on "The Importance of Sound in Today's World: Promoting Best Practices". In 2019 and Memorandum of Agreement was signed between the ICA and LSdS. The IYS2020 becomes one of the outcomes of that resolution.

IYS 2020 Structure

Liaison Committee: overview and coordination of the IYS 2020. ICAMichael Taroudakis and Marion Burgess

LSdS Christian Hugonnet, Jean-Dominique

Polack and Nicolas Lounis

Steering Committee:

Encourage and coordination of central and

regional activities Coordinators:

Marion Burgess and Michael Taroudakis Regional responsibility:

Be seen Internationally

BECOME AN IYS2020 SPONSOR

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Other levels of Sponsorship available

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Europe/Africa:

Michael Vorländer, Antonino di Bella, Antonio Perez-Lopez Asia/Pacific:

Jeong-Guon Ih, Kohei Yamamoto Americas:

Mike Stinson, Fausto Rodrigues, Julio Cordioli

National Coordinators:

Representatives from all ICA Member Societies and International Affiliateswill be responsible for the coordination and the reporting of the national activities and the activities of the International Affiliates. The Member Societies and International Affiliates are requested to appoint their representative by the end of September 2019. Name to be sent to the ICA Secretary General,

(ICASecGen@icacommission.org).

Also our society is in the process of setting up the regional Singapore Chapter of the Acoustical Society of America(ASA).

VII. BID FOR FUTURE INTERNATIONAL CONFERENCES

The Society of Acoustics(Singapore) will be hosting the ICSV28 in Singapore from 25-29 July 2021 at the Marina Bay Sands Hotel.

Government Bodies

www.mom.gov.sg

www.nea.gov.sg

www.lta.gov.sg

Technical and Research Sites

Corporate Sites

www.metaultrasound.com

www.noisecontrols.com

(The Society welcomes interested parties to contribute relevant websites to the above e useful links. For more information, please contact us. Thank you.)

VII. BID FOR FUTURE INTERNATIONAL CONFERENCES

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