

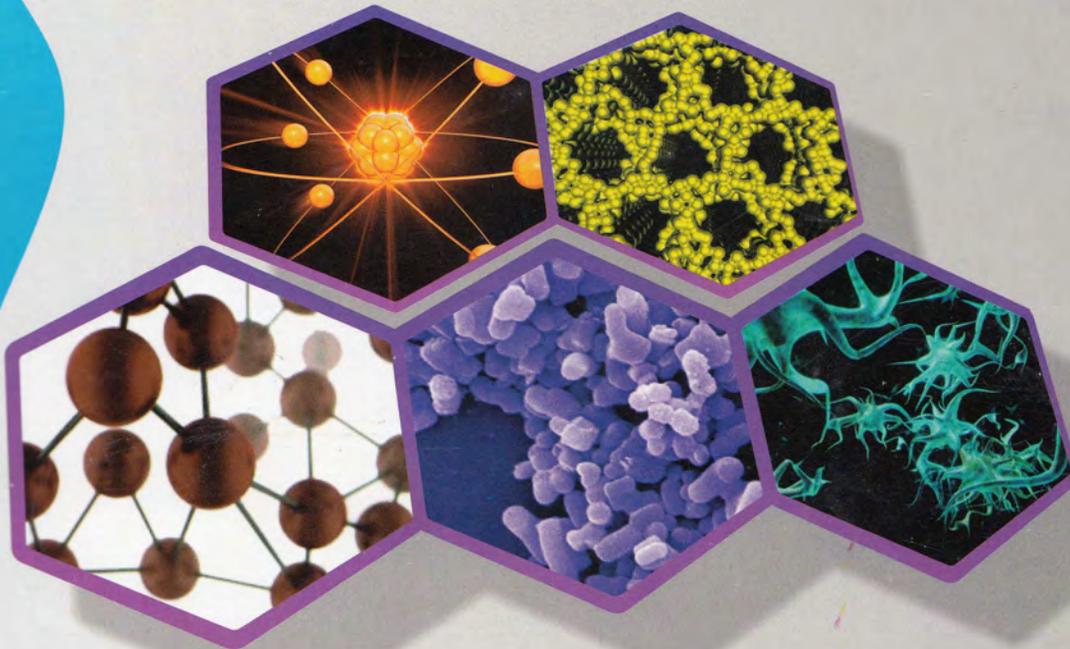
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# PROCEEDINGS

6<sup>th</sup> Ketingan Physics Forum

## International Conference on Physics and Its Applications (ICOPIA)

The Future of Advance Materials, Nanoscience and Nanotechnology



**Solo, October 3, 2012**



Published by:  
Ketingan Physics Forum  
Physics Department, Sebelas Maret University  
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## Foreword

This current Kentingan Physics Forum (KPF) event is a celebration for twelve years of KPF since its first conference held at Novotel Hotel Solo in 2001. This biannual international conference on physics and its applications is dedicated to promote any advances and innovations in physics directly to society and provide the opportunity to foster international scientific networking and cooperation. Due to the hot issues of development of nanoscience and nanotechnology in around the world over ten years, the 6<sup>th</sup> international conference on physics and its applications focused to areas of advanced materials, nanoscience and nanotechnology. However, in order to accomodate other researchers, we also accept several topics during correlate to the physics and applied physics.

These proceedings contains papers presented at International Conference on Physics and Its Applications that held in LORIN Hotel Solo on October 3, 2012. All papers submitted to this conference have been reviewed. We received more than fourty four papers from universities and institutions including from Japan, Malaysia, and Thailand countries. Papers are organized in four areas gathering the different topics according to the scientific and/or technological approach: Material Physics, Geophysics, Theoretical and Computational Physics, and Instrumentation Physics and Acoustic. We hope that these proceedings will serve as a valuable reference for the students and researchers in the areas of advanced materials, nanotechnology, and nanosciences.

Chairman,

Dr. Agus Supriyanto, M.Si.

## Contents

		Page
	Foreword	<i>Conference chairman committee</i> ii
	Contents	iii
<b>Material Physics</b>		
1.	Potential of GeSn Alloys for Application to Future Nanoelectronics	<i>Osamu Nakatsuka and Shigeaki Zaima</i> 1
2.	Small-Scale Energy Harvesting with Low-Dimensional Piezoelectrics	<i>Supasarote Nantakan Muensit and Kittirat Phooplub</i> 7
3.	Natural Rubber and Ethylene Propylene Diene Monomer (EPDM) Nanocomposites :The Effect of Halloysite Nanotubes (HNTs) as New Filler	<i>H. Ismail, S.Z. Salleh, P. Pasbakhsh and A.F.Mohd Nor</i> 11
4.	The Importance of an In-Plane-Longitudinal Kinetic Energy Coupling	<i>Khairurrijal, Fatimah A. Noor, Ferry Iskandar, and Mikrajuddin Abdullah</i> 17
5.	The study on X-ray diffraction patterns of flavonoid complex compound of Sterculia Urceolata Smith extraction yield from Kupang district, NTT Province	<i>Zakarias Seba Ngara, Igusti M. Budiana, Maria Dule, and Ria Patty</i> 23
6.	Structural analysis of undoped and Aluminium doped ZnO thin film by DC magnetron sputtering	<i>Didik Aryanto, Putut Marwoto, Ernawati Saptaningrum, and Sugianto</i> 29
7.	Synthesis and Characterization of Isotropik Composit - Resin Epoxy -Polyaniline /Barium M-Heksaferrit Bafe <sub>12</sub> -2xCOxZnxO <sub>19</sub> as Antiradar Materials	<i>Aghesti Wira Sudati, and M. Zainuri</i> 37
8.	Tensile Properties of Treated Two Natural Fiber	<i>Soekrisno, Ar Rohim, Ma'arif, and Harsojo</i> 43
9.	Characterization of Multilayer thin Film Ba <sub>0,8</sub> Sr <sub>0,2</sub> TiO <sub>3</sub> For Lighting Sensor Application	<i>A.Jamaluddin, E.Susilowati, S.Budiawanti, and Y. Iriani</i> 49
10.	Study of Thin Film Optical properties of (Ba, Sr) TiO <sub>3</sub> for Solar Cell Applications With Chemical Engineering Solution Method (CSD)	<i>Darsikin</i> 53
11.	Annealing Effect On Electronic Properties Of Transparent Oxide Semiconductor Ga-In-Zn-O (Gizo) Thin Films	<i>Dahlang Tahir</i> 57
12.	Characterization Of The Rooftile Merapi's Sand With Albassia Wood Ash Additif For Water Absorption And Thermal Conductivity Optimalisation (A Case Study On The Press Rooftile Manufacturing Industry In Tegowanuh, Kaloran, Temanggung Regency)	<i>Chotibul Umam, Suparmi, Cari and Harjana</i> 61

13	Structural, Mechanical and Water Sorption Properties of Chitosan Plastics	<i>Murniaty, Sri Juari Santosa, and Indriana Kartini</i>	69
14	Synthesis and magnetic properties of BaFe <sub>11</sub> 4Zn <sub>0</sub> 6O <sub>19</sub> using Co-precipitated method	<i>Irwan Ramli, M. Zainuri, and Findah R. Sholihah</i>	77
15	Characterization of Natural Cellulose from Kenaf Fiber	<i>H. Sosiati, Supatmi, Harsojo, Soekrisno, K Triayana</i>	81
16	Effect of Variation Concentration Nd <sup>3+</sup> on Physical Properties of TZBN glass as a host material glass laser	<i>Lita Rahmasari, Ika Nurmalia Sari, Riyatun, Ahmad Marzuki</i>	87
17	Structural Analysis of CdTe Thin Films Prepared by DC Magnetron-Sputtering Method	<i>Sugianto, Putut Marwoto, Zulkafli Othaman, and Didik Aryanto</i>	95
18	Effect of Natural Weathering on Mechanical and Morphological Properties of Low Density Polyethylene (LDPE)/ Thermoplastic Sago Starch (TPSS)/ Kenaf Core Fiber (KCF) Composites	<i>Norshahida Sarifuddin, Hanafi Ismail, and Zuraida Ahmad</i>	101
19	Study Of Decomposition Ilmenite In Hydrochloric Acid To Obtain High Grade Titanium Dioxide	<i>Sayekti Wahyuningsih, Sentot budi Rahardjo, Edi Pramono, Eko Sulistiyono, Florentinus Firdiyono, Hari Hidayatullah, and Fauchi</i>	107
20	Crystallography review on BaZr <sub>x</sub> Ti <sub>1-x</sub> O <sub>3</sub> thin film with variation of mole amount	<i>S. Hadiati, A.H. Ramelan, V.I Variansi, M. Hikam, B. Soegijono, D.F. Saputri, Y. Iriani</i>	111
21	An Optical Study of Tellurite Glasses Designed for Mid- Infrared Applications	<i>Ahmad Marzuki, Wahyudi, Adi Pramuda Cari and Rudi Susanto</i>	115
22	Effect of Washing Treatment on the Morphology of Vertically Aligned ZnO Nanorods	<i>Wuri Apriyana, Yateman Arryanto, Indriana Kartini</i>	119
23	Preparation of Ultrafine Grain Magnesium Carbonate	<i>Solihin, Eko Sulistiyono, Tri Arini, Eni Febriani, and Ariyo Suharyanto</i>	125
24	Influence of Ni Content on The Microstructure of Heat Treated Ti-Ni-Cu Shape Memory Alloys	<i>Efendi Maburri, Bambang Sriyono, Bintang Adjiantoro, and DN.Adnyana</i>	129
	Synthesis of Colloidal Silver-Chitosan Nanocomposites by Reduction Methode and Their Antibacterial Activity	<i>Endang Susilowati, Triyono, Sri Juari Santosa, Indriana Kartini</i>	133
25	Effect of Drying Temperature on The Mechanical Properties of Solvent-Casted Chitosan Plastics	<i>Endaruji Sedyadi, Nuryono, Indriana Kartini</i>	139
26	Mixture of Calcia-Yttria doped-Zirconia (CYZ) with LSGM-8282 as Solid Oxide Fuel Cell Electrolyte	<i>Fitria Rahmawati, Ismunandar, Bambang Prijamboedi, and Syoni Soepriyanto,</i>	147

69	27	The Influence of Bamboo Leaf Ash as Fly Ash on Physical Property of Concrete Cement	Nurlaela Rauf, Dahlang Tahir and Iin Roswansari	153
77	28	Thermal Properties of TZBN Glass on Composition Variation of Na <sub>2</sub> O	Riyatun, Litha Rahmasari and Ahmad Marzuki	157

### Geophysics and Acoustic

87	1	Application Acoustic Impedance Inversion to Identification Coal Bed Methane (CBM) of Sajau Formation in Berau Basin, East Kalimantan	Diana Putri Hamdiana, Shafa Rahmi, Ichwan Satrio and Supriyanto	161
95	2	Mapping Seismic Vulnerability Index on hasanudin Area Using Spectral ratio for disaster Prevention	Sabrianto Aswad, Sri Hartini Amiruddin, Dadang Ahmad Suriamiharja, Maria, and Ade Perdana Suhendratman	167
101	3	Does Indonesian Sea Still Rising?	Sorja Koesuma, Yen Nur Rahayu Purwoasih, and Mohtar Yuniarto	173
107	4	Shorelines Changes Survey in Bengkulu City Based on Microseismic Data	Muhammad Farid, Wahyudi, Kirbani Sri Brotopuspito, Sunarto, and Wiwit Suryanto	179
111	5	A Comparison of Filtering Method for Regional and Residual Field Separation from Bouguer Anomaly	Indah Permata Sari, Syamsu Rosid, and Eko Widiarto	185
115	6	Physio-Acoustic Study to Find Optimum Initial Time Delay	Anugrah Sabdono Sudarsono, I Gde Nyoman Merthayasa, and Suprijanto	195
119	7	The Influence of a Stack Against The Distribution of Pressure on The Eco-Friendly Thermoacoustic Resonator Tube	Affandi Faisal Kurniawan, Sigit Ristanto, and Choirul Huda	203

### Theoretical, Computational and Instrumentation Physics

129	1	The Solution of Schrodinger Equation for Coulombic potential plus Trigonometric Poschl-Teller Non-central Potentials Using NU method and Finite Romanovski Polynomials	Suparmi, and Cari	207
133	2	Modelisation of Degradation of Creatinine Using Bv Photo-Oxidation	Sri Suryani	217
139	3	Development of Control and Measurement Software for FCD/TD BATAN Diffractometer in Serpong, Indonesia	Bharoto, Nadi Suparno, Ahmad Ramadhani and Tri Hardi Priyanto	223
147	4	Approximate Solution of Schrodinger Equation for Modified Poschl-Teller Potential with Centrifugal	Cari, and Suparmi	229

6	Monolithic Integration of Different Optoelectronic Devices Using IFVD Method	<i>P.L. Gareso</i>	235
7	Analysis of Crystal Orientation on Al alloy due to Friction Stir Welding by Using Neutron Diffraction Method	<i>Tri Hardi Priyanto, Bharoto, Rifai Muslih, Iwan Sumirat, and Hery Mugirahardjo</i>	239
8	A Review on Particle Surface Charge Determination Instruments	<i>Suparno</i>	243
9	Plastic Optical Fiber Sensor for Displacement Measurement System	<i>Arifin, A. M. Hatta, M. S. Muntini, and A. Rubiyanto</i>	249

# The Influence of a Stack Against The Distribution of Pressure on The Eco-Friendly Thermoacoustic Resonator Tube

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## ABSTRACT

The influence of a stack against the amplitude of pressure waves on the eco-friendly thermoacoustic resonator tube has been done. This research aims to determine the optimal length of the stack so that it doesn't interfere with the flow of air in the tube resonators. To find out the influence of pressure distribution of stack is done by way of reviewing a wave of pressure on different places in the tube. Pressure sensor used in the form of mini microphone. There are eight sensors has been located in eight different location. Two of which were placed near the stack. Length of stack consist of four variations that is 2 cm, 4 cm, 8 cm, and 10 cm. Pressure variations in the data displayed by the oscilloscope. The result is a stack has huge to pressure around stack while a place remote from a stack of its pressure little change. The length of a stack the most small have on the distribution of stresses is a long stack 2 cm. The conclusion that the optimal length among all variations are made is length stack 2 cm.

Keywords : pressure distribution, thermoacoustic, sensor, stack

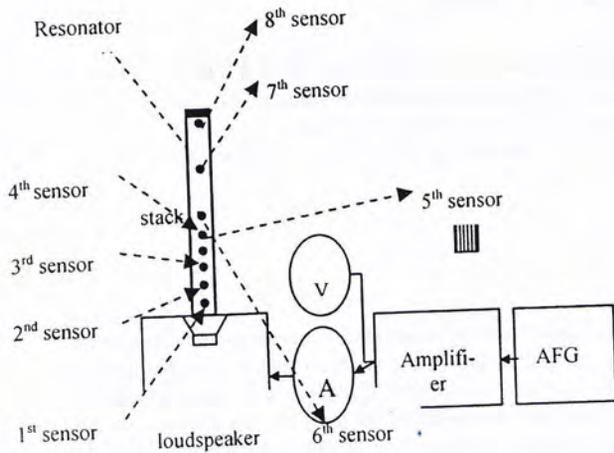
## INTRODUCTION

Air conditioning systems such as air conditioner and cool storage for food ingredients for example fruits, meat, canned food, beverage cans, vegetables, and drugs really needed by tropical countries like Indonesia. Likewise for the purpose of export the results of agricultural production and farm of course need a cooling system and a good packaging so that when it comes to shipping destination, export products are still in a State of fresh. Generally air conditioning is still have deficiencies. One of the deficiencies that still use coolant which is eco-friendly, such as Chloro Fluoro Carbon (CFC). The effect that can lead to damage to the ozone layer in the Earth's atmosphere (stratosphere) [1]. Damage to the ozone layer that can have an impact on the occurrence of global warming and climate change world. The negative effects of which could be caused by the life on earth as the increasing number of health problems and natural disasters. On the other hand, Indonesia had ratified the Montreal Protocol on substances the destroyer of ozone layer (Montreal Protokol on Substance that Deplete the Ozone Layer). Con-

sequently, Indonesia is obliged to eliminate CFC and other ozone destroyer gradually. The Indonesian government committed to stopping imports CFC started 31 december 2007 [1]. Therefore a cooling system of eco-friendly alternatives need to be developed, one of which is the cooling thermoacoustic. To produce optimal cooling in the thermoacoustic cooling, airflow conditioned laminar [2]. The existence of the stack on the thermoacoustic cooling resonators can be a hindrance in the transfer of heat that can change the shape of the air flow in tube resonators from laminar to turbulence. So, in order that the presence of stack does not interfere with the length of the stack must be made as fully as possible. The goal will be reached in this research is to figure out the optimal length of the stack so that it doesn't interfere with the flow of air in the tube resonators.

## EXPERIMENTAL

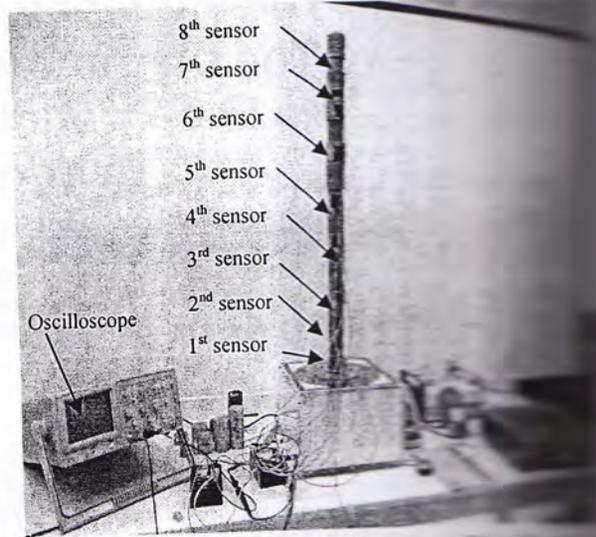
The arrangement of the measurement of the distribution of stresses on the eco-friendly thermoacoustic resonator tube presented in figure 1.



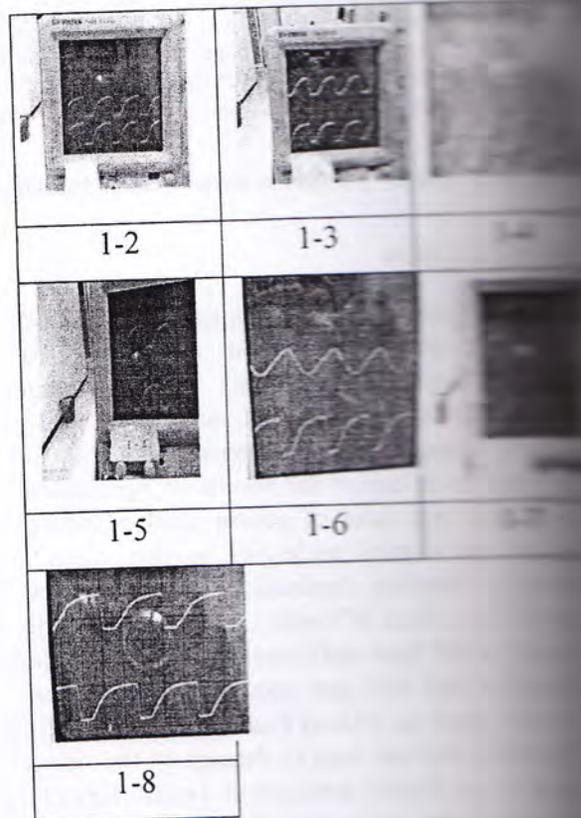
**Figure 1.** Setting pressure distribution measurement tools in thermoacoustic cooling resonators tube

Audio Function Generator (AFG) serves as a power station frequency. Frequencies used in this research equal to 100 Hz. Amplifier serves to strengthen signals AFG. Voltmeter and Ammeter for measuring current and functioning voltage input. In this research the current and voltage inputs are used, each 0.18 A and 1.2 V. Loudspeaker function to convert an electrical signal into sound signals. Tube resonators serve as scene of resonance wave sound. Stack function to the heat transfer [3]. 1<sup>st</sup> up to 8<sup>th</sup> sensors functioning mini microphone to measure pressure distribution. Pressure distributions can be seen from the pressure wave, while the pressure wave associated with the wave phase shift [4]. Outer expected of this research is procures long optimal stack to prevent the flow of air in a tube resonators. An indicator of success is obtained data pressure as a function long stack.

## RESULTS AND DISCUSSIONS



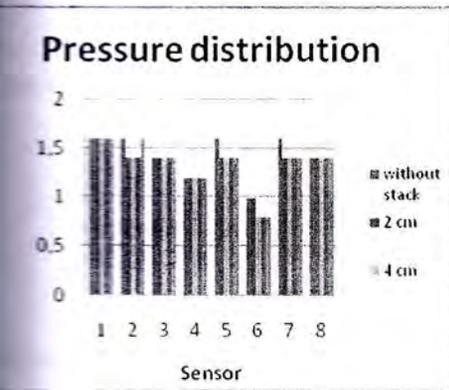
**Figure 2.** Arrangement Of Pressure Distribution Measurement devices



**Figure 3.** The result of a photograph pressure waves without a stack

The arrangement of the instrument shown in Figure 3. Pressure distribution on the tube measured with 1<sup>st</sup> up to 8<sup>th</sup> sensors. Reading the reading of the pressure distribution measured with early oscilloscopes. Next the data recorded

camera so that the data obtained in the form of photographs as in Figure 4. Lastly, the image is processed so that retrieved graphs. Discussion of influence of pressure distribution of stack is done by means of comparing the distribution of pressure on the tube resonator without stack to pressure tube resonators at the moment when the stack with the size of 2 cm, 4 cm, 6 cm and 10 cm. The visual image of the comparison result can be seen in Figure 4.



**Figure 4.** A graph the influence of a stack against the distribution of pressure at some point which will be reviewed

Based on Figure 4 may be known that pressure at the sensor to the sensor to 3, 1, 4, and sensors to 8 are not affected by variations in stack. This can occur because the sensors is placed far enough to stack. While 2<sup>nd</sup> sensor, 5<sup>th</sup> sensor, 6<sup>th</sup> sensor and 7<sup>th</sup> sensor affected by the stack. 2<sup>nd</sup> sensor, 5<sup>th</sup> sensor, 6<sup>th</sup> sensor and 7<sup>th</sup> sensor of the affected sensor stack due to its fairly close to the stack. The 2<sup>nd</sup> sensor though far affected by the presence of a stack. Thus it can be stated that the existence of a stack either 2 cm, 4 cm, 6 cm and 10 cm affects the pressure in the area around the stack and a small part of an area far from the stack. Next to know the influence of long stack the most small to pressure can be seen from 6<sup>th</sup> sensor and 7<sup>th</sup> sensor a sensor closest to stack. 6<sup>th</sup> sensor is a sensor of the decreasing temperatures while 7<sup>th</sup> sensor is the location of the increase in temperature [5]. Based on Figure 4 can be known that at length of stack 6<sup>th</sup> sensor (2 cm) having pressure equals without stack while other different length stack. While to the censorship of 7 all variation long stack having different pressures with pressure

without a stack. Thus the influence of length of the stack to the smallest pressure distribution is 2 cm length stack.

## CONCLUSION

A conclusion that obtained from this research is a stack has huge to pressure around stack while a place remote from a stack of its pressure little change. As for the length of the stack of the least influence on the distribution of pressure is 2 cm length stack. Thus the optimum length of all created variations is the length of the stack 2 cm.

## ACKNOWLEDGEMENT

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