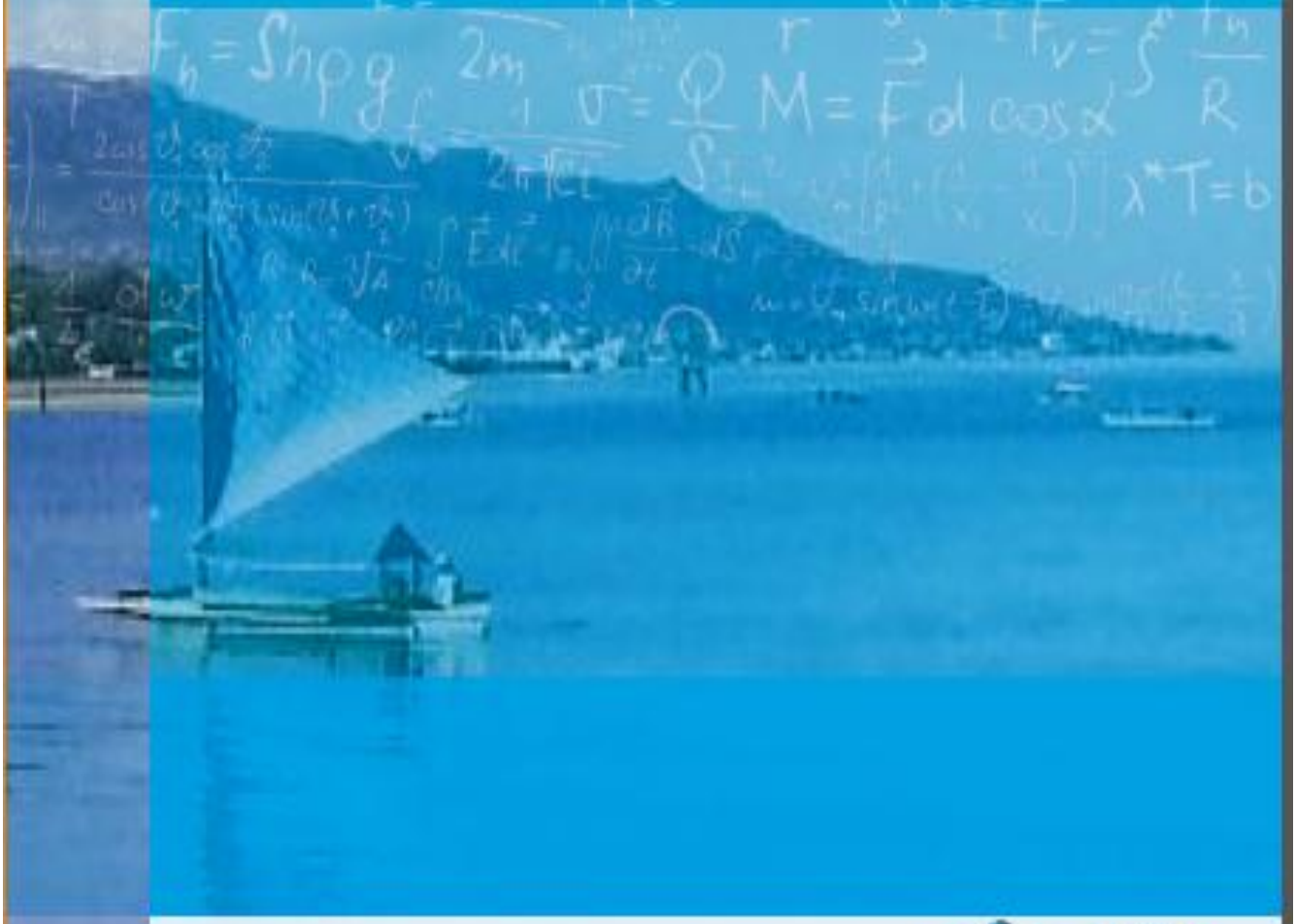
Basic Science
for Sustainable Marine Development

PROCEEDING
INTERNATIONAL SEMINAR 2015

Ambon, 3-4 June 2015



Organized by
Faculty of Mathematics and Natural Sciences
Pattimura University

PROCEEDINGS

1st International Seminar of Basic Science, FMIPA Unpatti - Ambon
June, 3rd – 4th 2015

ISBN : 978-602-97522-2-9

Mathematic and Natural Science Faculty
Pattimura University
Ir. M. Putuhena St.
Kampus Poka-Ambon
Pos Code 97233
Email:fmipa_unpatti@gmail.com

October 2015

Welcoming Address by The Organizing Committee

The honorable, the rector of Pattimura University

The honorable, the vice rector of academic affair, Pattimura University

The honorable, the vice rector of administration and financial affair, Pattimura University

The honorable, the vice rector of planning, cooperation and information affair, Pattimura University

The honorable, all the deans in Pattimura University

The honorable, the key note speakers and other guests.

We have to thank The Almighty God for the blessings that allow this International seminar can be held today. This is the first seminar about MIPA Science in which the Faculty of MIPA Pattimura University becomes the host. The seminar under the title Basic Science for Sustainable Marine Development will be carried out on 3 June 2015 at Rectorate Building, the second floor. There are 250 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

This International seminar is supported by the amazing people who always give financial as well as moral supports. My special thanks refer to the rector of Pattimura University, Prof. Dr. Thomas Pentury, M.Si, and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, M. Si. I also would like to express my deepest gratitude to Dr. Kotaro Ichikawa, the director of CSEAS Kyoto University, Prof. Bohari M. Yamin, University of Kebangsaan Malaysia, Prof. Dr. Budi Nurani Ruchjana (Prisident of Indonesian Mathematical Society/Indo-MS), Dr. Ir. A. Syailatua, M.Sc (Director of LIPI Ambon), and Hendry Ishak Elim, PhD as the key note speakers. We expect that this international seminar can give valuable information and contribution especially in developing basic science for sustainable marine development in the future.

Last but not least, we realize that as human we have weaknesses in holding this seminar, but personally I believe that there are pearls behind this seminar. Thank you very much.

Chairman

Dr. Netty Siahaya, M.Si.

Opening Remarks
By Dean of Mathematic and Natural Science Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 17th anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title Basic Science for Sustainable Marine Development. The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

Dean of Mathematic and Natural Science Faculty

Prof. Dr. Pieter Kakisina, M.Si.

Contents

Fabrication of Novel Fibers from Rejected Ocean Materials and Their Potential Applications

Hendry Izaac Elim

Head of Nanomaterials for Photonics Nanotechnology Laboratory (Lab. N4PN),
Department of Physics, Faculty of Mathematics and Natural Sciences, Pattimura University,
Ambon, Indonesia.
Email: hendryelim@gmail.com

ABSTRACT

A simple fabrication technique is applied to make some novel fibers from some rejected ocean materials such as beach stones, shells and coral reefs. The fabricated fibers show a kind of rubber type fiber with good mechanical properties. In order to understand the oscillation types from such fibers, we derived a simple mathematical formulation to explain it. We found that the original elements from ocean materials both from living and death things or organism/ animals such as $_{20}$Ca, $_{6}$C and $_{8}$O in $CaCO_3$ molecule can become an elastic fiber when the structure of it was changed to be like a two dimensional (2D) layer that can be rolled as a fiber form. Further research work is needed to understand optical properties of the novel fibers.

INTRODUCTION

If we talk about a complicated work and how to realize it, then we need a smart simple technique. Simple does not mean easy to understand it. Therefore, we need a very strong background of wisdom and knowledge as a part of our wisdom to make the process of finding output in detail. Maluku (*Moluccas*), a spicy province as a part of eastern Indonesia has various types of small islands with the number of them over thousands of islands. In addition, at the heart of these many types of small islands, it has the deepest ocean with roughly as deep as 10,000 m (~10 km) located in a small Banda island with Banda ocean. In general, we can divide these thousands island provinces from its north part to its south part into at least 27 main area islands as follows: 1. Morotai, 2. Halmahera, 3. Ternate, 4. Tidore, 5. Bacan, 6. Obi, 7. Manggole, 8. Sanana, 9. Buru, 10. Seram, 11. Ambon, 12. Lease, 13. Goram, 14. Banda, 15. Teo, 16. Nila, 17. Serua, 18. Kei, 19. Aru, 20. Tanimbar, 21. Babar, 22. Damar, 23. Sermatang, 24. Moa, 25. Letty, 26. Kisar, and 27. Wetar. These are just like an illustration written in Holy Bible about Elim, a fruitful area in the desert located between Mara and Mount Sinai, a north part of Red sea (Zech. 6:2,8; New King James, 1982) surrounding with 70 palm trees among 12 spring wells (Exod. 15:27; New King James, 1982). If we focus on the deepest wisdom, we will choose the deepest sea or ocean among these 27 important divided areas in thousands island province which is in reality exist at the heart of these province called as Banda ocean with her deepest ocean and amazing varieties of sea plants and animals inside it. In the view of the world or the whole earth, Banda and the area surrounding it located at the heart of world triangle coral reef in which from about 1200 types

of coral reefs, in the world, half of them exist in this triangle coral reef location. In our research activities, we had mapped on how to employ the marine wastes with our simple creative technology as depicted inside Fig. 1 in these areas polluted due to human errors (their limited knowledge and wisdom, Jer. 51:17; New King James, 1982) starting from the air wastes to the ocean wastes. More people on earth more problems they created for their environments and neighbors. This is exactly like God said that "*I am finding all men are in fact stupid*." Therefore, the only solution is to fear He who created everything for your unsure knowledge or your next step wisdom (Prov. 1:7; New King James, 1982). Currently, we had tried to employ the broken nature or all types of wastes grouping into 5 big groups as ranked from top part of the earth to the lower part of the earth as shown in Fig. 1: (1). air (skies), (2). mountains, (3). rivers, (4). lands (islands) and (5). ocean (seas).

In this paper, we provide our preliminary works on creating simple novel fibers from some marine wastes materials such as some rejected ocean materials from beach stones, shells and coral reefs and even the skins of sea foods animals with their new structures and new behaviors. Based on our initial findings, these kinds of fibers have elasticity behavior like a rubber that can be elongated as long as 7 times longer. While on the skin of a type of shell that we found in a beach of Murnaten village located in the West Seram island, we observed that such novel fiber is strong due to a bound of many small fibers that are tied together in contact one another to be a micro fiber which is just like you gather many small elastic nanofibers together to be a powerful nano-stick.

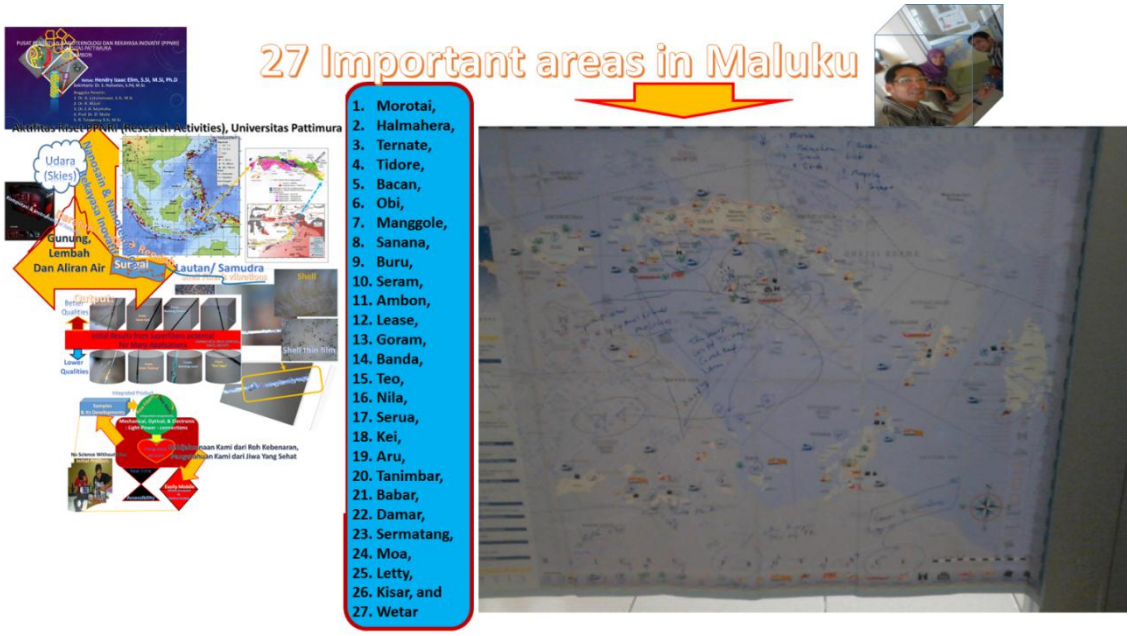


Figure 1. Mapping the wise works on how to employ marine wastes in thousand spicy islands of Maluku province, Indonesia. (*Courtesy of PPNRI-LEMLIT*).

EXPERIMENTAL PROCEDURE AND TECHNIQUE

In order to find out a novel 2D structure that can be rolled to be a strong fiber like a string from a marine waste material that is like a hidden treasure that people never think about it, we use a very simple technique based on our nanoscience and nanotechnology knowledge background with 4 direct steps treatment as shown in Fig. 2.

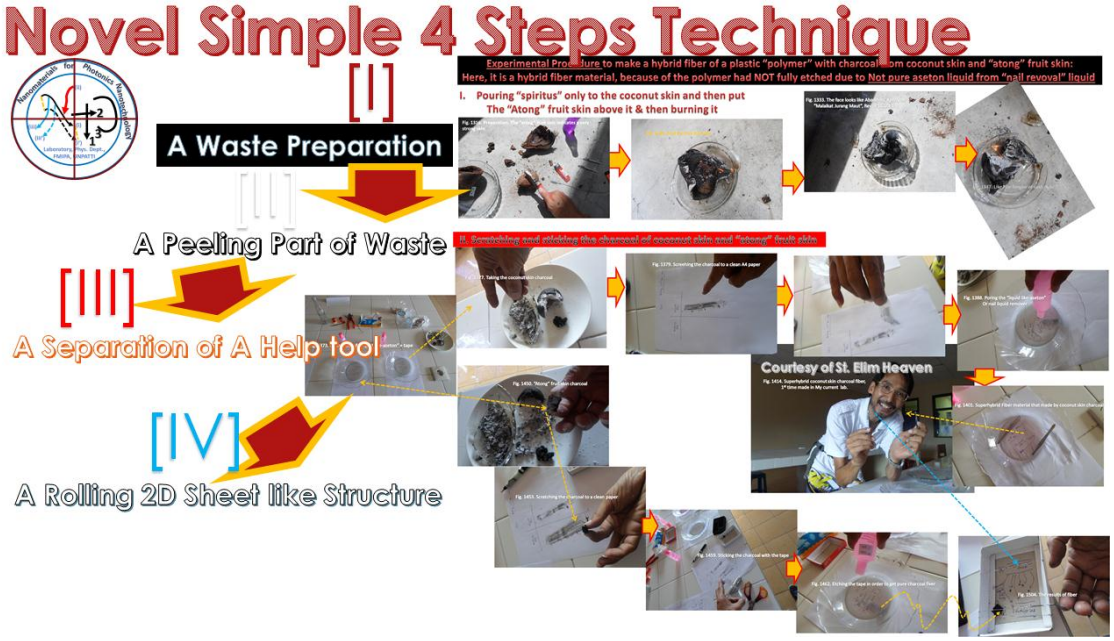


Figure 2. Our 4 steps simple technique to manipulate a waste marine sample into a treasure novel structure with some attractive various properties.

In this picture, the 1st example of our 1st experiment at our Lab. N4PN that we used it to make a novel fiber from an outer dried coconut skin found inside Pattimura University (UNPATTI) and was firstly presented at an annual forestry department seminar of UNPATTI on 15th December 2014 in Elizabeth hotel, Ambon.

Based on our 1st experiment at Lab. N4PN depicted on Fig. 2, we then tried to apply it for fabricating some novel fibers from marine waste samples such as in a used shell (a shell without the sea animal inside it), in a priceless beach stone found near a beach, and in a broken part of coral reef found in a beach edge as well as in some skins of sea animals thrown from a sea food restaurant and then we investigated some preliminary aspects of their mechanical and optical properties as well as their basic electronics behaviors. Fig. 3 presents our work in a simple picture for the complicated system in nature. All equipment in our laboratories are not so expensive and sophisticated like the human made expensive laboratories in modern countries. However, we have been working based on The Truth Spirit ("Dio Spirito", John 14:17; 1 Pet. 4:14; New King James, 1982) in human heart (2 Cor. 4:6; The Light from the darkest; New King James, 1982) that inspires all of our limited young researchers. Most of blind scientists may not understand this, but from our work outputs, they have their second change to understand it (Elim, 2015 a–c);. Moreover, based on our former works on nanofibers, nanorods and nanohybris materials (Cai et al., 2011; Chin et al., 2006; Elim et al., 2006; Elim et al., 2007 a &b; Elim et al., 2008 a&b; Elim et al., 2009; Elim et al., 2011; Liu et al., 2006; Tian et al., 2006; Zhu et al., 2006) we obtained that due to confinement effects these all types of novel fibers or nanowires/nanorods can produce a very good optical properties particularly related to nonlinear optical behavior directly connected to communication system.

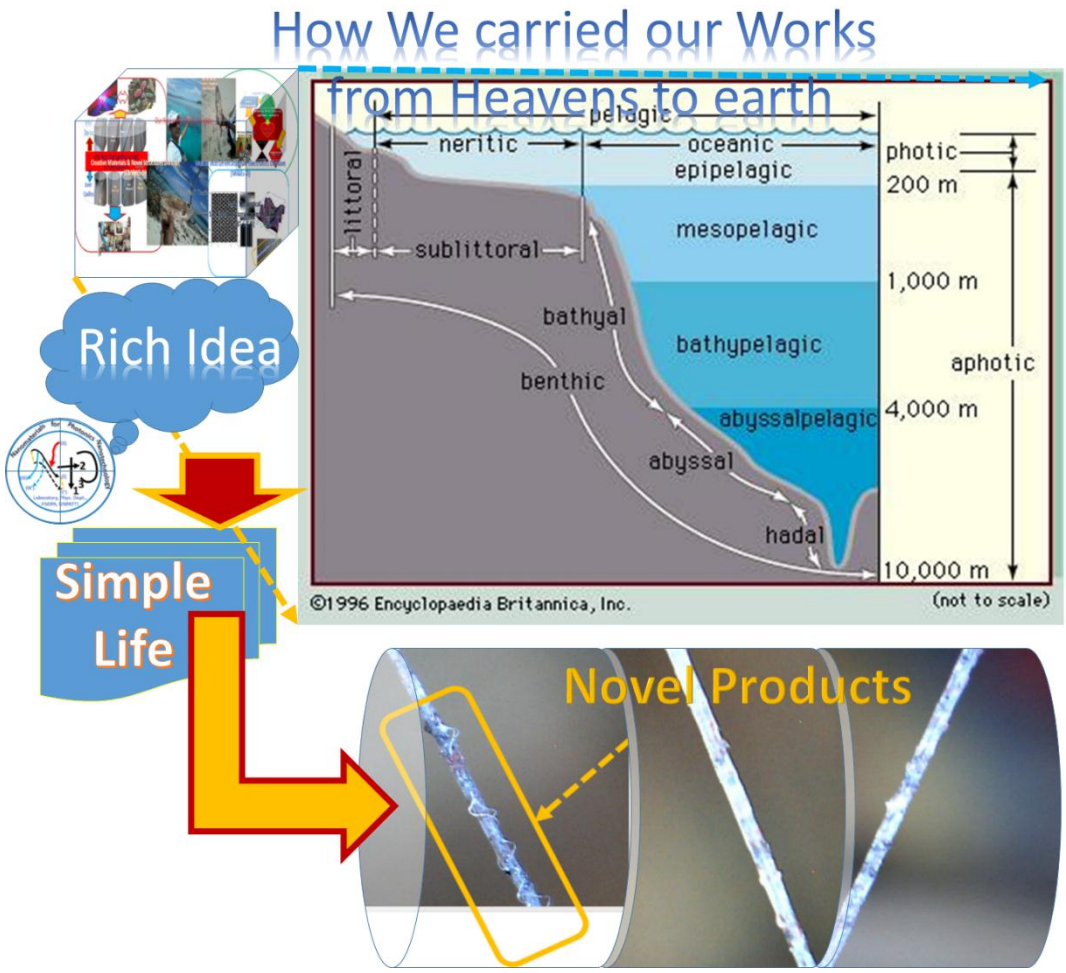


Figure 3. How we carried out our works. The 3 types novel fibers shown in this picture are the products from a simple structure's manipulation of a sea shell, a beach stone and a broken coral reef found in Murnaten village beach (West Seram, Maluku province, Indonesia), respectively (from left to right).

Mechanical properties especially related to string fiber constant (*k*), Young modulus, and bulk modulus can be investigated by using a simple technique based on the elastic fiber is considered as a string. A simple mathematical formulation to explain it is derived based on the sound wave type wave observed in our novel fibers made by ocean wastes. Due to the facts that the dominant chemical contents of ocean shells or coral reefs are consisting of $CaCO_3$ molecule, we then focus on the two dimensional (2D) like-structure made by the atoms of $_{20}Ca$, $_{6}C$ and $_{8}O$, so that we can find out the elastic rubber-like fibers based on what we wanted. This 2D layer that can be rolled in a fiber form.

RESULTS AND DISCUSSION

The fabricated fibers show a kind of rubber type fiber with good mechanical properties. A detail investigation of physical string constant measurement is in progress. Figure 4 depicts the theoretical and simulation calculation of sound wave type observed in the collaboration of many tiny fibers (about few μm) that covered a big micro fiber (few hundreds of μm) of our novel shell fiber as shown inside Fig. 3.

In order to understand the oscillation types from such fibers, we derived a simple mathematical formulation to explain it just like as described in the top part of Fig. 4. By using a Fourier transform when the sound wave happened due to the vibration of the elastic rubber like-fiber in which the center part of it (*L*/2, where *L* is the length of the total fiber) was pulled and then released, we obtain the solution as follows

$$y(x,t) = C_1 \mathrm{Sin}(C_2)\ \mathrm{Sin}(A_1(L)x)\mathrm{Cos}(A_2(L)t), \quad (1)$$

where C_1 and C_2 are constants related to the amplitude of the sound waves made by fiber oscillation, while $A_1(L)$ and $A_2(L)$ are parameters directly related to the length of fiber associated with 1D parameters (*x*) and time (*t*), respectively.

We found that the original elements from ocean materials both from living and death things or organism/ animals such as $_{20}$Ca, $_{6}$C and $_{8}$O in $CaCO_3$ molecule can become an elastic fiber when the structure of it was changed to be like a two dimensional (2D) layer that can be rolled as a fiber form. Further research work is needed to understand optical properties of the novel fibers. Recently, we have been conducting then FTIR measurements of these related novel fibers in our Lab. N4PN and PPNRI-LEMLIT that gave a preliminary indicators of C-C bonding peak at around 1653 cm^{-1}. However, we think that a further detail investigation should be carried out to understand these kinds of fibers better.

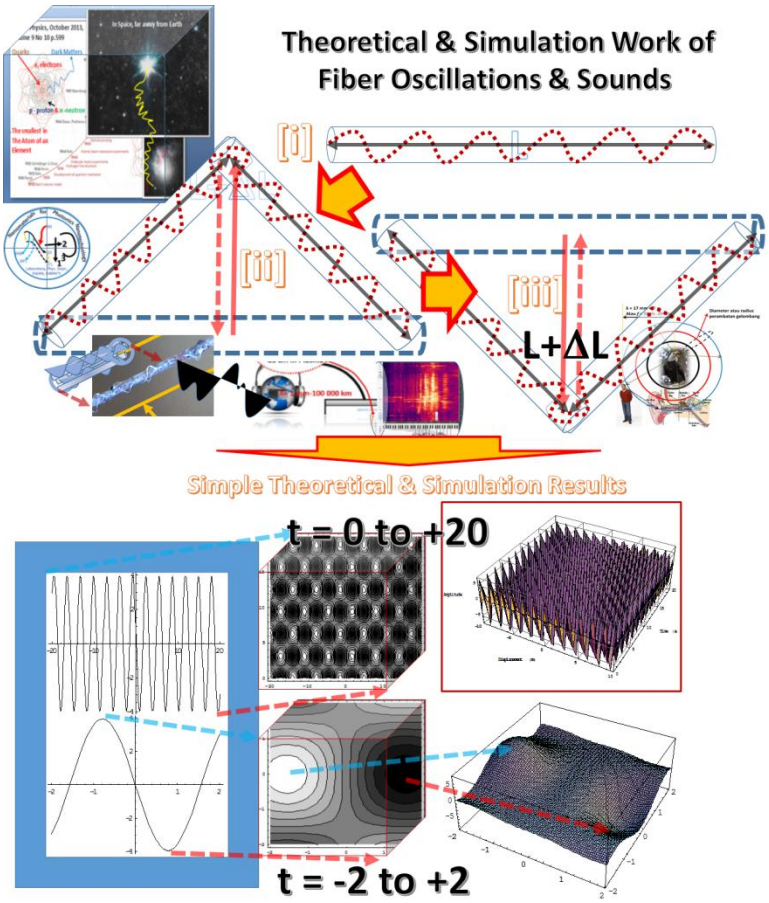


Figure 4. Theoretical and simulation calculation of sound wave type in a novel shell fiber: from a giant God-universe to a simple laboratory man-made

SUMMARY

In summary, we have successfully fabricated some novel fibers using marine wastes materials with our simple 4 steps technique. These novel fibers gave an indicators of a unity of many small microfibers in a big size of few hundred microfiber. The mechanical and optical properties of these fibers are still under investigating in our research center of nanotechnology (PPNRI-LEMLIT).

REFERENCES

Cai, B., Sugihara, O., Elim, H.I., Kaino, T., and Adschiri, T. 2011. A Novel Preparation of High-Refractive-Index and Highly Transparent Polymer Nanohybrid Composites, Applied Physics Express 4. 092601.

Chin, K.C., Gohel A., Elim, H.I., Chen, W., Ji, W., Chong, G.L., Sow, C.H., Wee, A.T.S. 2006. Modified carbon nanotubes as broadband optical limiting nanomaterials, Journal of Materials Research - Vol. 21, No. 11, 2758-2766. Special Focus Issue (Review): Nanotubes and Nanowires (*Invited*).

Elim, H.I., Yang, J., Lee, J.Y., Mi, J., and Ji, W. 2006. Observation of saturable and reverse saturable absorption at longitudinal surface plasmon resonance in gold nanorods. Applied Physics Letters 88, 083107.

Elim, H.I., Anandakathir, R., Jakubiak, R., Chiang, L.Y., Ji, W., and Tan, L.-S. 2007a. Large concentration-dependent nonlinear optical responses of starburst iphenylaminofluorenocarbonyl methano[60]fullerene pentads, J. Mater. Chem. 17, 1826 The abstract of this paper is also featured on NASA, STI, *STAR* Vol. 45, Number 19, p.87.

Elim, H. I., Ji, W., Ng, M.T., and Vittal, J.J. 2007b. $AgInSe_2$ nanorods: A semiconducting material for saturable absorber, Appl. Phys. Lett. 90, 033106 (2007b).

Elim, H.I., Jeon, S-H., Verma, S., Ji, W., Tan, L-S., Urbas, A., and Chiang, L.Y. 2008a. Nonlinear Optical Transmission Properties of C_{60} Dyads Consisting of a Light-Harvesting Diphenylaminofluorene Antenna, J. Phys. Chem. B Letters 112, 9561-9564.

Elim, H.I., Ji, W., Yang, J., and Lee, J.Y. 2008b. Intensity-Dependent Enhancement of Saturable Absorption in PbS-Au_4 Nanohybrid Composites: Evidence for Resonant Energy Transfer by Auger Recombination, Appl. Phys. Lett. 92, 251106.

Elim, H.I., Cai, B., Kurata, Y., Kaino, T., Sugihara, O., Adschiri, T., Chu, A-L., and Kambe, N. 2009. Refractive index control and Rayleigh scattering properties of transparent TiO_2 nanohybrid polymer, J. Phys. Chem. B 113 (30), 10143–10148 (2009). Elim, H.I., Cai, B., Sugihara, O., Kaino, T., and Adschiri, T. 2011. Rayleigh scattering study and particle density determination of high refractive index TiO_2 nanohybrid polymer, Phys. Chem. Chem. Phys., 13 (10), 4470 - 4475**.**

Elim, H.I. 2015a. Marine Waste Simple Technology, DOI: 10.13140/RG.2.1.3520.9125.

Elim, H.I. 2015b. Man best works versus God-hand made works (unpublished) DOI: 10.13140/RG.2.1.1494.2881.

Elim, H.I. (2015c). *God and His Dragon*, p. 6 x DOI: 10.13140/R.G.2.1.1214.7363.

Liu, Y.J., Sun, X.W., Elim, H. I., and Ji, W. 2006. Gain narrowing and random lasing from dye-doped polymer-dispersed liquid crystals with nanoscale liquid crystal droplets, Appl. Phys. Lett. 89, 011111.

The Holy Bible, New King James Version. 1982. The Word of God: A collaboration based on God Spirit and created human being, Thomas Nelson, Inc. (printed in Columbia), pp. 41, 359, 540, 621, 667, 705.

Tian, L., Elim, H.I., Ji, W., and Vittal, J.J. 2006. One Pot Synthesis and Third-order Nonlinear Optical Properties of $AgInS_2$ Nanocrystals, Chem. Commun. 41, 4276 – 4278.

Zhu, Y., Elim, H.I., Foo, Y-L., Yu, T., Liu, Y., Ji, W., Lee, J-Y., Shen, Z., Wee, A.T-S., Thong, J.T-L. T., and Sow, C-H. 2006. ZnO Nanoparticles Beaded Multiwalled Carbon Nanotubes: For Ultrafast Nonlinear Optical Switching, Advanced Materials 18 (5), 587-592.