Outline of the result of survey on technology seeds of fiber research organizations

1. Purposes and details of survey

In addition to research and survey on the following ① to ③ for identification of technology seeds of fiber research organizations, this survey was conducted for the purpose of organizing useful information and setting a future direction toward a final goal of building technology development system through collaboration among government, industry and academia in Japan.

① To conduct survey on fiber-related research themes at universities and public research organizations in Japan for database creation.

② Based on the survey results, to map technology seeds at major universities and public research organizations.

③ To study a system for expansion and renewal of database.

2. Information collection methods and database creation

We have collected themes reported at the most recent annual meetings of the three fiber-related academic societies (the Society of Fiber Science and Technology, Japan, the Textile Machinery Society of Japan and the Japan Research Association for Textile End-Uses) and the information posted on the websites of public research organizations, which have been incorporated in database (a total of 1,046 items).

① The Society of Fiber Science and Technology, Japan	FY2013 annual meeting: 321 items FY2012 annual meeting: 332 items
② The Textile Machinery Society of Japan	FY2013 annual meeting: 96 items
③ The Japan Research Association for Textile End-Uses	FY2013 annual meeting: 122 items
④ Information on the websites of public research organizations	: 175 items

- Though there were some duplications in themes reported in "FY2012" and "FY2013," FY2012 themes were listed for the Society of Fiber Science and Technology, Japan alone.
- While research themes of the universities could be collected comprehensively from the annual meetings of the three academic societies, the information of public research organizations were poorly available. Thus, we complemented the information with other information posted on the website of each organization.

Classification of 1,046 reports by theme (classification based on the themes at the

annual meeting of the Society of Fiber Science and Technology, Japan) is shown in the table below.

"Textile science" and "forming, processing and spinning" are dominant with accounting for over 20% of the total, respectively, which are followed by "physics of fiber and polymer solid" and "physics of soft materials." On the other hand, the least is "science and engineering of textile machines."

At the public research organizations, the leading theme is "forming, processing and spinning."

① Physics of fiber and polymer solid	108 (10%)
② Creation of fiber and polymer material	69 (7%)
③ Function of fiber and polymer material	97 (9%)
④ Biomedical materials	41 (4%)
⑤ Forming, processing and spinning	230 (22%)
⑥ Physics of soft materials	104 (10%)
⑦ Textile science	282 (27%)
⑧ Natural fiber and biological polymer	99 (9%)
⑨ Science and engineering of textile machines	16 (2%)

3. Research organizations that have been surveyed

Based on the information of the database described in "2." above, the characteristics of fiber research conducted by universities and public research organizations have been

compiled and organized. We have picked up 27 universities that have presented many reports at academic meetings, etc. as well as 16 public research organizations that have conducted many fiber-related researches.

University (27 universities) (Random order)

(1)	Shinshu University	(8)	Kyushu University	(15)	Shizuoka University	(22)	Nara Women's University
(2)	University of Fukui	(9)	Gunma University	(16)	Okayama University	(23)	Ochanomizu University
(3)	Kyoto Institute of Technology	(10)	Bunka Gakuen University	(17)	Osaka University	(24)	Yokohama National University
(4)	Tokyo University of Agriculture and Technology	(11)	Yamagata University	(18)	Kobe University	(25)	University of Yamanashi
(5)	Tokyo Institute of Technology	(12)	Gifu University	(19)	Sugiyama Jogakuen University	(26)	The University of Shiga Prefecture
(6)	Kyoto University	(13)	Nagoya Institute of Technology	(20)	Nagasaki University	(27)	Shimane University
(7)	The University of Tokyo	(14)	University of Tsukuba	(21)	Toyota Technological Institute		

Public research organization (16 public research organizations) (Random order)

(1)	Toyama Industrial Technology Center	(7)	Industrial Research Institute of Ishikawa	(13)	Ehime Institute of Industrial Technology
(2)	Tokyo Metropolitan Industrial Technology Research Institute	(8)	Industrial Technology Center of Okayama Prefecture	(14)	Technology Research Institute of Osaka Prefecture
(3)	Industrial Technology Center of Fukui Prefecture	(9)	Textile Research Institute of Gunma Prefecture	(15)	Osaka Municipal Technical Research Institute
(4)	Aichi Center for Industry and Science Technology	(10)	Industrial Technology Center of Tochigi Prefecture	(16)	Kanagawa Industrial Technology Center
(5)	Hyogo Prefectural Institute of Technology	(11)	Yamagata Research Institute Of Technology		
(6)	Industrial Technology Center, Gifu Prefecture Government	(12)	Industrial Research Institute of Shizuoka Prefecture		

4. Major research contents of each research organization

Out of research themes undertaken by each university and public research organization,

the major research contents that represent the characteristics of each organization are summarized in the table below.

(1) University

University name	Major research content
Shinshu University	・ Synthesis and application of functional polymers ・ Development of functional textiles and their functional evaluation, engineering of sensitivity materials ・ Textile bioengineering URL : http://www.shinshu-u.ac.jp/faculty/textiles/english/
University of Fukui	・ Synthesis and application of functional polymers ・ Processing technology for high-polymer materials and fibers ・ Functionalization of fibers and textiles URL : http://www.u-fukui.ac.jp/eng/index.html
Kyoto Institute of Technology	・ Design, synthesis, characteristic analysis and application development of bio-based materials ・ Development of bio-based fibers ・ Composite materials (composites) URL : http://www.kit.ac.jp/english/index.html
Tokyo University of Agriculture and Technology	・ Precise control of higher-order structure of polymers and functionalization ・ Synthesis and application of organic semiconductor materials ・ Structural analysis of biological materials, design and production of new functional materials URL : http://www.tuat.ac.jp/en/index.html
Tokyo Institute of Technology	・ Structure and physical property in forming high-polymer materials ・ Structure, physical property and application development of nanofibers ・ Structure, behavior analysis and control of polymer liquid crystals ・ Structure and physical property of carbon materials, composite materials URL : http://www.titech.ac.jp/english/index.html
Kyoto University	・ Manufacturing and compounding of cellulose nanofibers ・ Creation of new functional materials using woody materials and various biomaterials ・ Basics and application of polymeric compounds ・ Analysis of functions and physical property of polymers URL : http://www.kyoto-u.ac.jp/en
The University of Tokyo	・ Creation of new bio-based plastics ・ Structure of new bio-based nanomaterials, high functionalization URL : http://www.u-tokyo.ac.jp/en/

Kyushu University	・ Nanostructure control of molecular structure ・ High functionalization of organic nanomaterials -- surface and interface scientific approach ・ Hierarchical structure control of natural macromolecule, creation of new biofunctional materials URL : http://www.kyushu-u.ac.jp/english/index.php
Gunma University	・ Reforming, functionalization and recycling of natural polymers ・ Structural analysis of polymer materials URL : http://www.gunma-u.ac.jp/english/index-e2.html
Bunka Gakuen University	・ Physiology and sensitivity engineering concerning comfort and functionality of clothing URL : http://www.bunka.ac.jp/contents/en_index.htm
Yamagata University	・ Forming and precision processing of polymer materials ・ Analysis and control of superstructure of polymers URL : http://www.yamagata-u.ac.jp/index.html
Gifu University	・ Structure and behavior analysis of soft materials such as colloid, etc. ・ Nanostructure control of fiber and polymer materials – crazing URL : http://www.gifu-u.ac.jp/en/
Nagoya Institute of Technology	・ Behavior analysis of biopolymers, creation of new functional materials ・ Structural control and evaluation analysis of polymer films, creation of new functional materials URL : http://www.nitech.ac.jp/eng/index.html
University of Tsukuba	・ Development of functional polymers with conductivity, etc. URL : http://www.tsukuba.ac.jp/english/
Shizuoka University	・ Structure, physical property and reforming of fibers and polymers ・ Structure, physical property and behavior analysis of organic films and liquid crystals URL : http://www.shizuoka.ac.jp/english/
Okayama University	・ Superstructure control of polymer materials, precise polymerization ・ Analysis of superstructure of polymers, development of new polymers URL : http://www.okayama-u.ac.jp/index_e.html
Osaka University	・ Analysis of damage progression of advanced composite materials URL : http://www.osaka-u.ac.jp/en/index.html
Kobe University	・ Physiology and sensitivity engineering concerning comfort and functionality of clothing ・ Structure and physical property of polymer materials, creation of new functional materials URL : http://www.kobe-u.ac.jp/en/

Sugiyama Jogakuen University	・ Functionalization of natural polymers (keratin, cellulose) URL : http://en.sugiyama-u.ac.jp/index.html
Nagasaki University	・ Functionalization and characterization of polymer materials, creation of new functional materials URL : http://www.nagasaki-u.ac.jp/en/
Toyota Technological Institute	・ Structural analysis of polymer compounds and development of new polymer materials URL : http://www.toyota-ti.ac.jp/english/
Nara Women's University	・ Evaluation of dynamic property, surface property and comfort of textile materials URL : http://www.nara-wu.ac.jp/index-e.html
Ochanomizu University	・ Analysis and application of function of functional polymers URL : http://www.ocha.ac.jp/en/index.html
Yokohama National University	・ Evaluation of thermal comfort of clothing URL : http://www.ynu.ac.jp/english/index.html
University of Yamanashi	・ Development of nanofiber by laser heating method URL : http://www2.yamanashi.ac.jp/
The University of Shiga Prefecture	・ Development of nanofibers and nanocomposites by ES method URL : http://www.usp.ac.jp/english/index.html
Shimane University	・ Functionalization and application of polymer materials URL : http://www.shimane-u.ac.jp/en/

(2) Public research organization

Public research organization name	Major research content

Toyama Industrial Technology Center	・ Development of fiber reinforced composite materials and products ・ Development of healthcare-related products ・ Development of other various technical textiles URL : http://www.itc.pref.toyama.jp/english/eng_index.html
Tokyo Metropolitan Industrial Technology Research Institute	・ Dyeing and functional processing ・ Clothing physiology and sensitivity engineering evaluation ・ Development of fiber reinforced composite materials URL : https://www.iri-tokyo.jp/english/index.html
Industrial Technology Center of Fukui Prefecture	・ Spreading of carbon fiber bundle, development of high-order processed products using spread yarn ・ Functional processing of fibers, development of e-textile ・ Development related to textile machines and systems URL : http://www.fklab.fukui.fukui.jp/kougi/ (※JP site only)
Aichi Center for Industry and Science Technology	・ e-textile ・ Functional processing using nanotechnology, development of new materials ・ Development of other various technical textiles URL : http://www.aichi-inst.jp/en/
Industrial Technology Center, Gifu Prefecture Government	・ Reforming of fibers, development of materials ・ Development of new products with emphasis on the environment ・ Development related to textile machines and systems URL : http://www.iri.rd.pref.gifu.lg.jp/ (※JP site only)
Industrial Research Institute of Ishikawa	・ Consistent test fabrication of thermoplastic composite materials from carbon fiber fabrics ・ Processing of composite materials such as CFRP, etc. ・ Development of highly functional textiles URL : http://www.irii.jp/index-e.html
Industrial Technology Center of Okayama Prefecture	・ New dyeing and functional processing technology of natural fibers (jeans, etc.) ・ Development of fiber reinforced composite materials URL : http://www.pref.okayama.jp/sangyo/kougi/english/top.html
Hyogo Prefectural Institute of Technology	・ Development related to textile machines and systems ・ Development of new functional materials URL : http://www.hyogo-kg.jp/ (※JP site only)
Ehime Institute of Industrial Technology	・ Development of towels with higher value URL : http://www.pref.ehime.jp/h30103/sangiken/index.html (※JP site only)

Textile Research Institute of Gunma Prefecture	・ New dyeing and functional processing technology of natural fibers URL : http://www.pref.gunma.jp/07/p20210013.html （※JP site only）
Industrial Technology Center of Tochigi Prefecture	・ New dyeing and functional processing technology of natural fibers ・ Development related to textile machines and systems URL : http://www.iri.pref.tochigi.lg.jp/ （※JP site only）
Yamagata Research Institute of Technology	・ New processing technology of natural fibers URL : http://www.yrit.pref.yamagata.jp/ （※JP site only）

5. Systems for expansion and renewal of database

In promotion of research and development through collaboration among government, industry and academia, it is crucial to clearly identify the research details and technology seeds of each organization for the purpose of information sharing among us. In overseas nations, such systems represented by European 2BFUNTEX (http://www.2bfuntex.eu/) and European Textile Technology Marketplace (ETTMa) have been built.

The database compiled this time was revised after referring to the “database of advanced fiber technology researchers and research themes in Japan” of the “next generation fiber processing, etc. research and development survey project” conducted by Japan Chemical Fibers Association in 2006. Such information requires periodic update in the future and the system for such update needs to be built.

The database compiled this time plans to be posted on the industry-university collaborative information provision website operated by Fiber Innovation Incubator (Fii) in Shinshu University for public viewing. Also, the database will continue to be expanded in cooperation with Fii.

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