



Nanofabrics

Technology Insight Report



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Introduction

A fiber that has a width of less than 1000 nanometers (1000 nm or 1 μm) is generally defined as a nanofiber. A nanoparticle is defined as a small group of atoms or molecules with a radius of less than 100 nanometers (100 nm). Particles on the nanoscale have a very high surface area to volume ratio, whereas this ratio is much lower for objects on the macroscopic scale.

Nanofabrics are textiles engineered with small particles that give ordinary materials advantageous properties such as superhydrophobicity, odor and moisture elimination, increased elasticity and strength, and bacterial resistance. Depending on the desired property, a nanofabric is either constructed from nanoscopic fibers called nanofibers, or is formed by applying a solution containing nanoparticles to a regular fabric.

Applications of nanofabrics have the potential to revolutionize textile manufacturing and areas of medicine such as drug delivery and tissue engineering.

Points covered:

- Overview of the top companies involved in nanofabrics and their publication trend
- Focus on the processes for nanofabrics
- Trends for different applications of nanofabrics and their patent activity

Patent Search Results

Using the commercial patent database [PatSeer](#) as our data source we used the following search query to create our patent set.

TAC- Title, Abstract, Claims

TACD- Title, Abstract, Claims, Description

IC– International Class

TAC: (nano* wd3 (fabric OR fabrics OR fiber* OR fibre* OR textile*) OR nanofabric OR nanofabrics OR nanotextile* OR nanofiber* OR nanofibre*)

AND

IC: (D01* OR D02* OR D03* OR D04* OR D05* OR D06* OR D07* OR D99* OR D21* OR G01N* OR B82* OR B81* OR A61*)

AND NOT

TACD: ((glass w1 (fiber* OR fibre*)) OR fiberglass* OR fiberglass* OR semiconduct* OR capacitor* OR rectifier* OR detector* OR switching device* OR batter* OR transformer* OR electric machine* OR transponder* OR insulator* OR conductor* OR transistor* OR multiplexer* OR ((photovoltaic* or solar*) w/3 (cell* or batter*)))

AND NOT

IC: ("C08J5/08" OR "C12Q1/68" OR H01* OR H02* or H03* OR H04* OR H05* OR H99*)

- The query was directed to search through the title, abstract and claims with one publication per family was generated and imported in Patent iNSIGHT Pro.
- After reviewing few results esp. from older publications, we came across some similar but irrelevant terms which we then excluded from full text and irrelevant class were also excluded using NOT operator.
- Additional irrelevant terms were searched across full text using the advance search option within Patent iNSIGHT Pro and the query used was

(FT) contains (RFID OR "Radio* frequency identification" OR MEMS or NEMS OR DRAM OR SRAM OR "flash memory" OR semi-conductor* OR bio-sensor* OR biosensor* OR (memory* w/2 (device* or devise*)) OR "random access memory" OR Micro-Electro-Mechanical System* OR Nano-electro-mechanical system* OR ((Microelectromechanical* or Nanoelectromechanical*) w/2 system*) or ((dynamic* or static*) w/2 ("random access memory")) OR "micro systems technology")

- Finally result set of 3262 records formed the basis of our research.

The publications included in the report are updated as of 20th October, 2013

Class Description:

D01: Natural Or Artificial Threads Or Fibres; Spinning
D02: Yarns; Mechanical Finishing Of Yarns Or Ropes; Warping Or Beaming
D03: Weaving
D04: Braiding; Lace-Making; Knitting; Trimmings; Non-Woven Fabrics
D05: Sewing; Embroidering; Tufting
D06: Treatment Of Textiles Or The Like; Laundering; Flexible Materials
D07: Ropes; Cables Other Than Electric
D99: Subject Matter Not Otherwise Provided For In This Section
D21: Paper-Making; Production Of Cellulose
G01N: Investigating Or Analysing Materials By Determining Their Chemical Or Physical Properties
B81: Micro-Structural Technology
B82: Nano-Technology
A61: Medical Or Veterinary Science; Hygiene

C08J5/08: Glass Fibres
C12Q1/68: Involving Nucleic Acids
H01: Basic Electric Elements
H02: Generation, Conversion, Or Distribution Of Electric Power
H03: Basic Electronic Circuitry
H04: Electric Communication Technique
H05: Electric Techniques Not Otherwise Provided
H99: Subject Matter Not Otherwise Provided

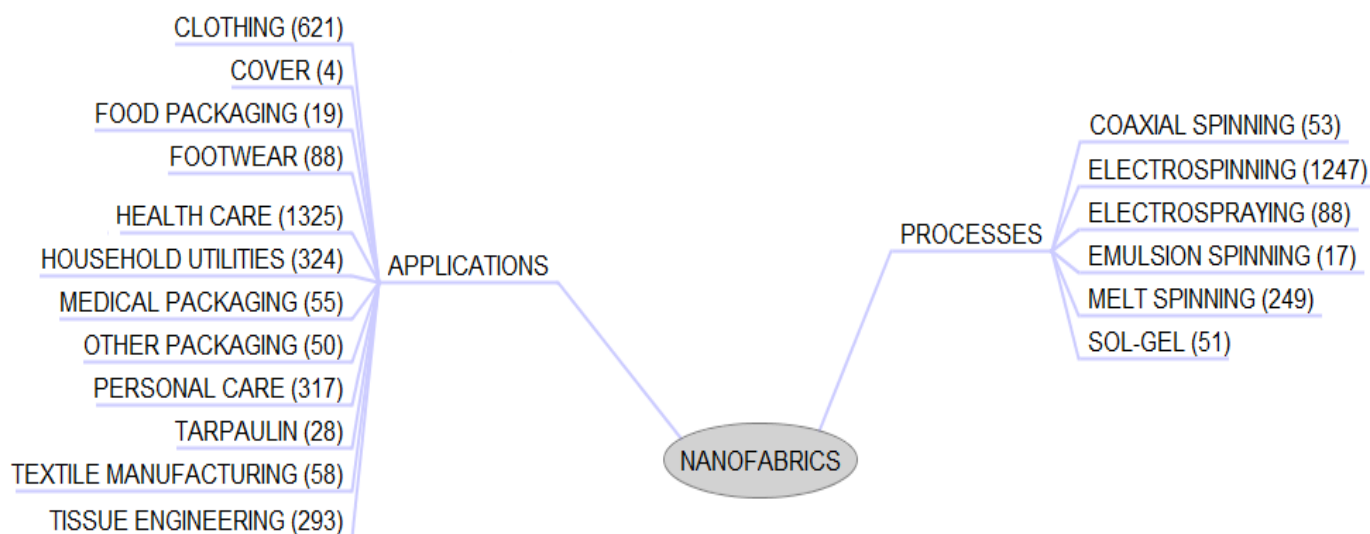
Technical Segmentation (Patent Categories)

To get deeper insights nanofabrics record set was classified as follows:

By Applications	By Processes
<ul style="list-style-type: none"> • Clothing • Cover • Food Packaging • Footwear • Health Care • Household Utilities • Medical Packaging • Other Packaging • Personal Care • Tarpaulin • Textile Manufacturing • Tissue Engineering 	<ul style="list-style-type: none"> • Coaxial Spinning • Electrospinning • Electrospraying • Emulsion Spinning • Melt Spinning • Sol-gel

The illustration below shows the different categories prepared and the number of records in each. The categorization involved defining a search strategy for each topic and then conducting the search using the Advanced Searching capability in Patent iNSIGHT Pro. Details of search strings used for each category are given in Appendix.

Categorization Tree



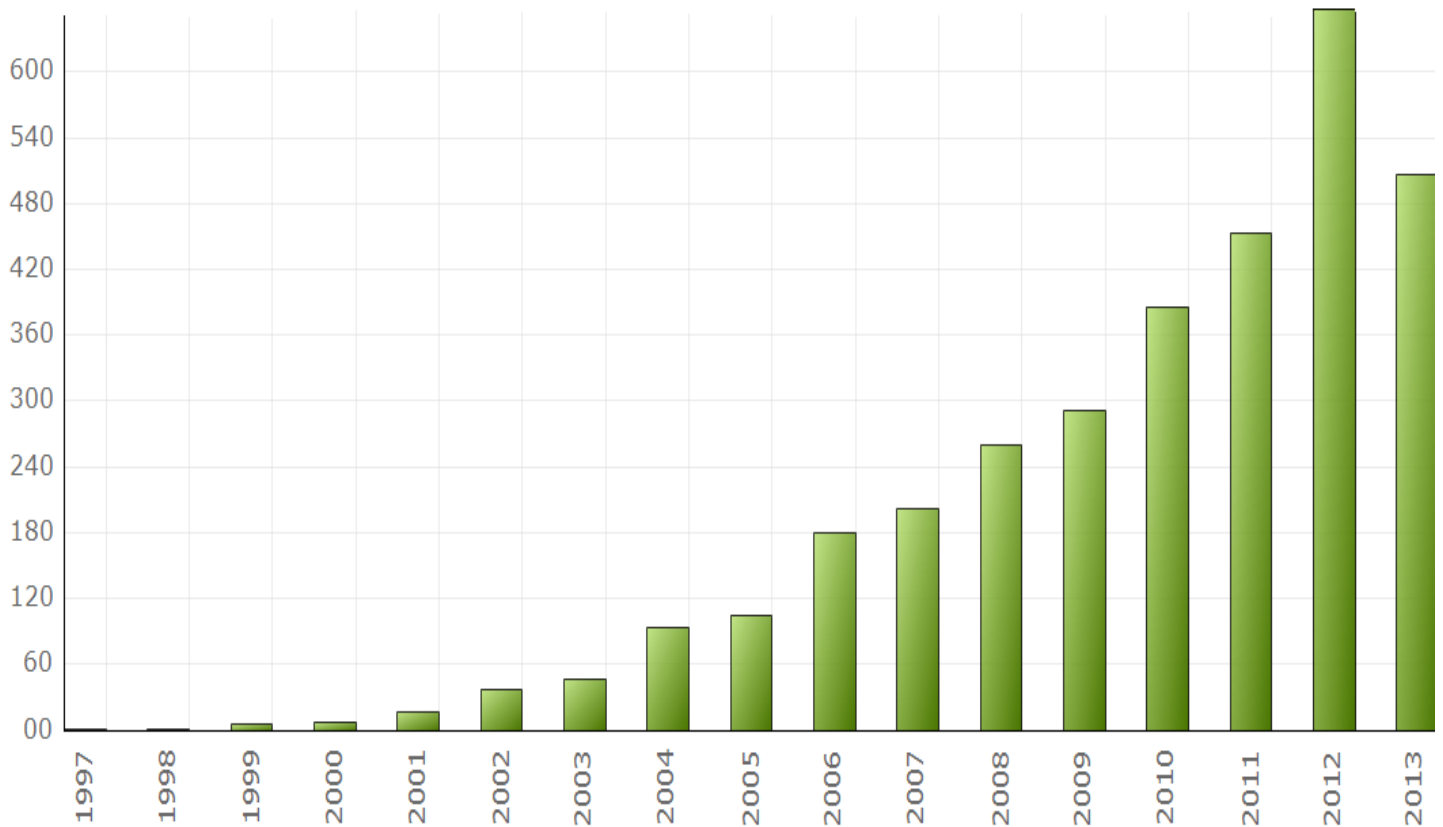
IP Analysis

Publication Trend

What has been the publication trend for nanofabrics?

Nanofabric publications have emerged from 1997 with the real surge in the activity around this technology has happened in the last 5 years.

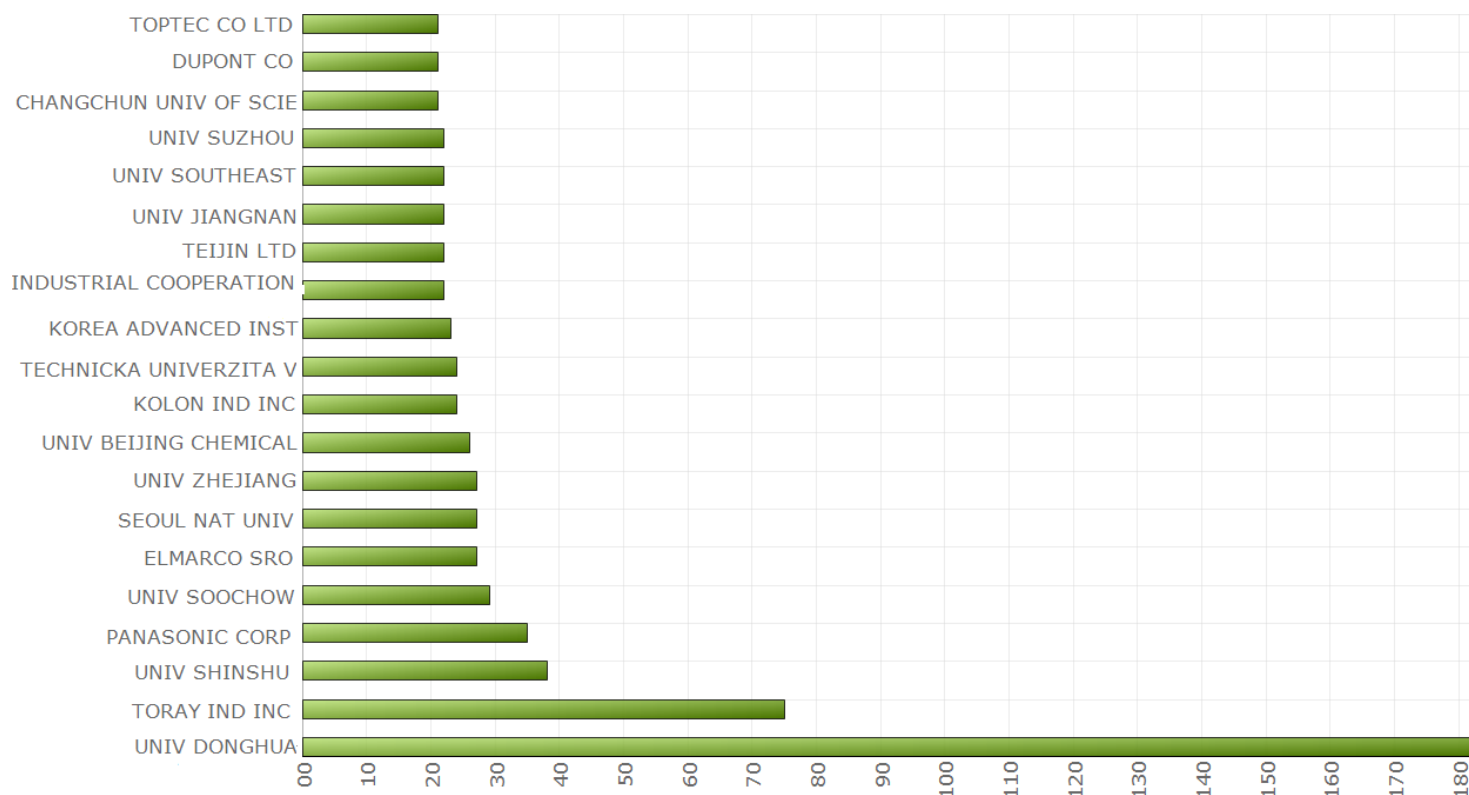
It's clear the current activity around these technologies is likely to continue seeing more innovation in the near future.



How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the publication trend chart was generated on a single click using the dashboard tool.

Top Players



The top organizations are:

1. UNIV DONGHUA
2. TORAY IND INC
3. UNIV SHINSHU
4. PANASONIC CORP
5. UNIV SOOCHOW
6. ELMARCO SRO
7. SEOUL NAT UNIV
8. UNIV ZHEGIANG
9. UNIV BEIJING CHEMICAL
10. KOLON IND INC

11. TECHNICKA UNIVERZITA V
12. KOREA ADVANCED INST
13. INDUSTRIAL COOPERATION
14. TEIJIN LTD
15. UNIV JIANGNAN
16. UNIV SOUTHEAST
17. UNIV SUZHOU
18. CHANGCHUN UNIV OF SCIENCE
19. DUPONT CO
20. TOPTEC CO LTD

How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the assignee clean- up tools were used to normalize the names. Different cleanup tools were leveraged:

- To locate assignees for unassigned records
- To clean up records having multiple assignees
- To locate the correct assignee names for US records using the US assignments database
- To merge assignees that resulted from a merger or acquisition or name change.

The dashboard tool within Patent iNSIGHT Pro was used to find the top 20 assignees within the given patent set. A visual graph was created based on the results of the top assignees with the number of patents alongside each one.

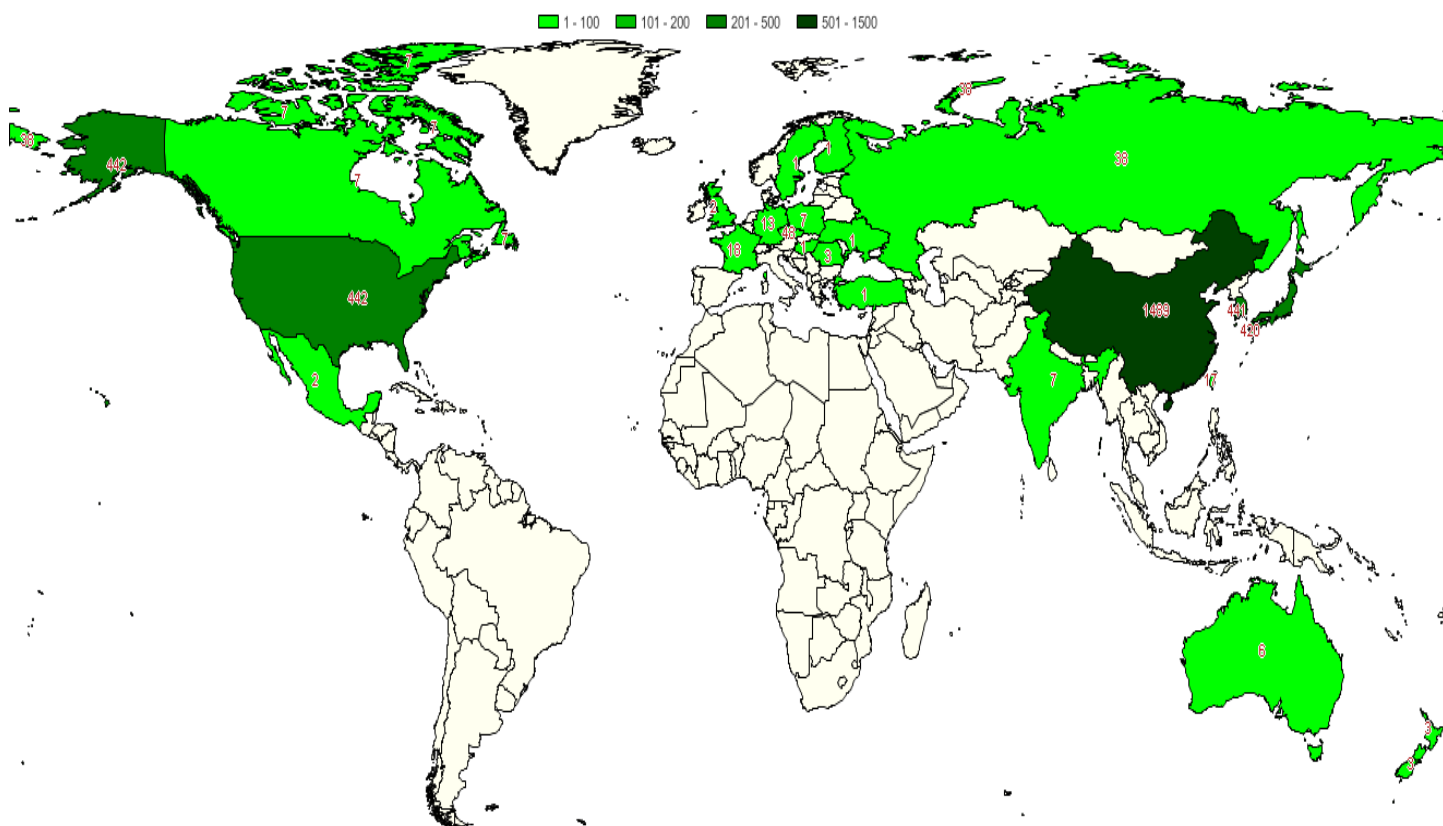
The complete Assignee table is available in the following Excel file:

<http://www.patentinsightpro.com/techreports/1013/List%20of%20Assignees.xls>

Research activity around world

How is research around nanofabrics spread across different countries?

In terms of regional pockets where patent protection is being sought most frequently for these technologies, CN leads the count, followed by the US and KR. The table below ranks top priority countries and helps provide an indication of where innovation in this area is originating:



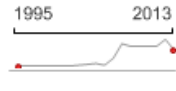



Country Code	Total
CN	1489
US	442
KR	441
JP	420
CZ	48







How we did it?




The map was generated using the Priority country coverage map option provided in the dashboard tool within Patent iNSIGHT Pro.



Companies - Key Statistics

Here we summarize key parameters of Top 15 companies such as filing trend, Top inventors in each company and Coverage of underlying patent families

Assignee	Total No. of Records	Avg. No. of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Inventor (Top 5)	Co-Assignees	Coverage (Includes families)							
							US	EP	WO	JP	CN	KR	CZ	IN
UNIV DON GHU A	184 (5.6%)	0.08		2002 - 2013	LIMIN ZHU(31) XIUMEI MO(24) DENG GUANG YU(15) JIAN YONG YU(12) XIA XIA SHEN(10)	NANTON G CELLULOSE FIBERS CO LTD(1)	0	0	0	0	184	0	0	0
TORA Y IND INC	75 (2.3%)	0.93		2002 - 2011	OCHI TAKASHI(20) TAKEDA MASANOBU(9) NARUSE YOSHIHIRO(7) KIDAI AKIRA(6) NONAKA SHUICHI(6)	HARADA SHOJI KK(1) HATTA TATEAMI KK(1) JO COSMETICS KK(1) SAKAI OVEX CO LTD(1)	3	2	3	68	9	4	0	0
UNIV SHIN SHU	38 (1.2%)	0.24		2004 - 2012	KIM ICK SOO(25) LEE JAE HWAN(19) KIM BYOUNG SUHK(19) WATANABE KEI(14) TSUKADA MASUHIRO(5)	TOPTEC CO LTD(20) MISUZU KOGYO KK(1) NANBU PLASTICS CO LTD(1) NISSIN KOGYO CO LTD(1) RESUKA KK(1)	1	0	7	36	0	18	0	0
PANA SONI C CORP	35 (1.1%)	0.11		2004 - 2013	ISHIKAWA KAZUNOBU(21) KUROKAWA TAKAHIRO(20) TAKAHASHI MITSUHIRO(19)	TOKYO INST TECH(16) KURITA WATER IND	2	1	3	33	2	0	0	0

					SUMIDA HIROTO(18) TANIOKA AKIHIKO(15)	LTD(2) UNIV KOBE(1)											
UNIV SOOCHOW	29 (0.9%)	0		2006 - 2012	ZHOU LIXIA(9) HE JIHUAN(8) KONG HAIYAN(8) SUN JUN(3) BAOQI ZUO(3)	No Co-Assignee Present	0	0	0	0	29	0	0	0			
ELMARCSRO	27 (0.8%)	0.59		2005 - 2012	MARES LADISLAV(12) PETRAS DAVID(9) MALY MIROSLAV(7) KOVAC MARTIN(5) CMELIK JAN(5)	PRIMECELL A S(1) ROYAL NATURAL MEDICINE (1) TECHNICK A UNIVERZITA V LIBERCI(1)	9	6	18	9	8	5	26	3			
SEOUL NATIONAL UNIV	27 (0.8%)	0.67		2003 - 2012	JANG JYONG SIK(8) LEE BYOUNG SUN(3) YU WOONG RYEOL(3) PARK EUN YU(3) KWAK SEUNG YEOP(3)	REPUBLIC OF KOREA MANAGEMENT RURAL DEVELOPMENT(2)	4	0	1	2	2	27	0	1			
UNIV ZHEJIANG	27 (0.8%)	0.04		2002 - 2013	PENG SU(2) ZHONGRU GOU(2) GUAN ZUGUANG CHEN(2) ZHUKANG XU(2) XU ZHIKANG HUANG(2)	No Co-Assignee Present	0	0	1	0	27	0	0	0			
UNIV BEIJING CHEMICAL	26 (0.8%)	0.15		2005 - 2012	NIE JUN(10) GUIPING MA(7) YANG LIU(5) XIAOPING YANG(4) XULIANG DENG(3)	No Co-Assignee Present	0	0	0	0	26	0	0	0			
KOLON IND	24 (0.7%)	0.25		2006 -	OH HEUNG RYUL(8)	No Co-Assignee	1	0	1	0	0	24	0	0			

INC				2009	LEE YONG HWAN(7) KANG YEON KYEONG(6) KIM CHUL KI(6) KANG YUN KYUNG(6)	Present											
TECHNICAL UNIVERSITY LIBRARY	24 (0.7%)	0.12		2007 - 2012	WIENER JAKUB(9) POKORNY PAVEL(8) AMLER EVZEN(8) KOSTAKOVA EVA(7) FILOVA EVA(7)	ASTAV EX MEDICINAV CR(8) STUDENT SCIENCE(7) NANOPHARMA(6) VIOLA NANOTECHNOLOGY SRO(2) ASTAV MAKROMOLEKULARNI CHEMIE(1)	0	2	3	0	0	0	24	0			
KOREAN ADVANCED INSTITUTE OF SCIENCE & TECHNOLOGY	23 (0.7%)	0.13		2003 - 2012	KIM IL DOO(8) JO SEONG MU(4) KIM DONG YOUNG(3) HONG JAE MIN(3) SONG YONG WON(3)	No Co-Assignee Present	9	3	1	3	1	23	0	0			
INDUSTRIAL COOPERATION FOUNDATION CHO NBUK NATIONAL UNIVERSITY	22 (0.7%)	0.55		2006 - 2011	KIM HAK YONG(21) GIL MYUNG SEOP(6) PARK JONG HUN(5) SHEIKH FAHEEM ARJAMEND(4) NAM KI TAEK(4)	WOONGJIN CHEMICAL CO LTD(1)	3	0	8	0	0	18	0	0			

TEIJI N LTD	22 (0.7%)	0.41		2003 - 2011	KAKAZU AYA(6) INAGAKI KENJI(2) KUWABARA HIROAKI(2) YASUI SATOSHI(2) OTA MASAMI(2)	AMBIC CO LTD(2) MAHLE FILTER SYSTEMS JP CORP(1) NAT INST FOR MATERIA LS SCIENCE(1) UNIV RICE WILLIAM M(1)	2	3	2	20	2	1	0	0
UNIV JIAN GNA N	22 (0.7%)	0		2007 - 2012	HONGBO WANG(6) WEIDONG GAO(6) QUFU WEI(3) GAO WEIDONG(3) WANG HONGBO(3)	JIANGSU YUNFU GARMEN T CO LTD(1)	0	0	0	0	22	0	0	0

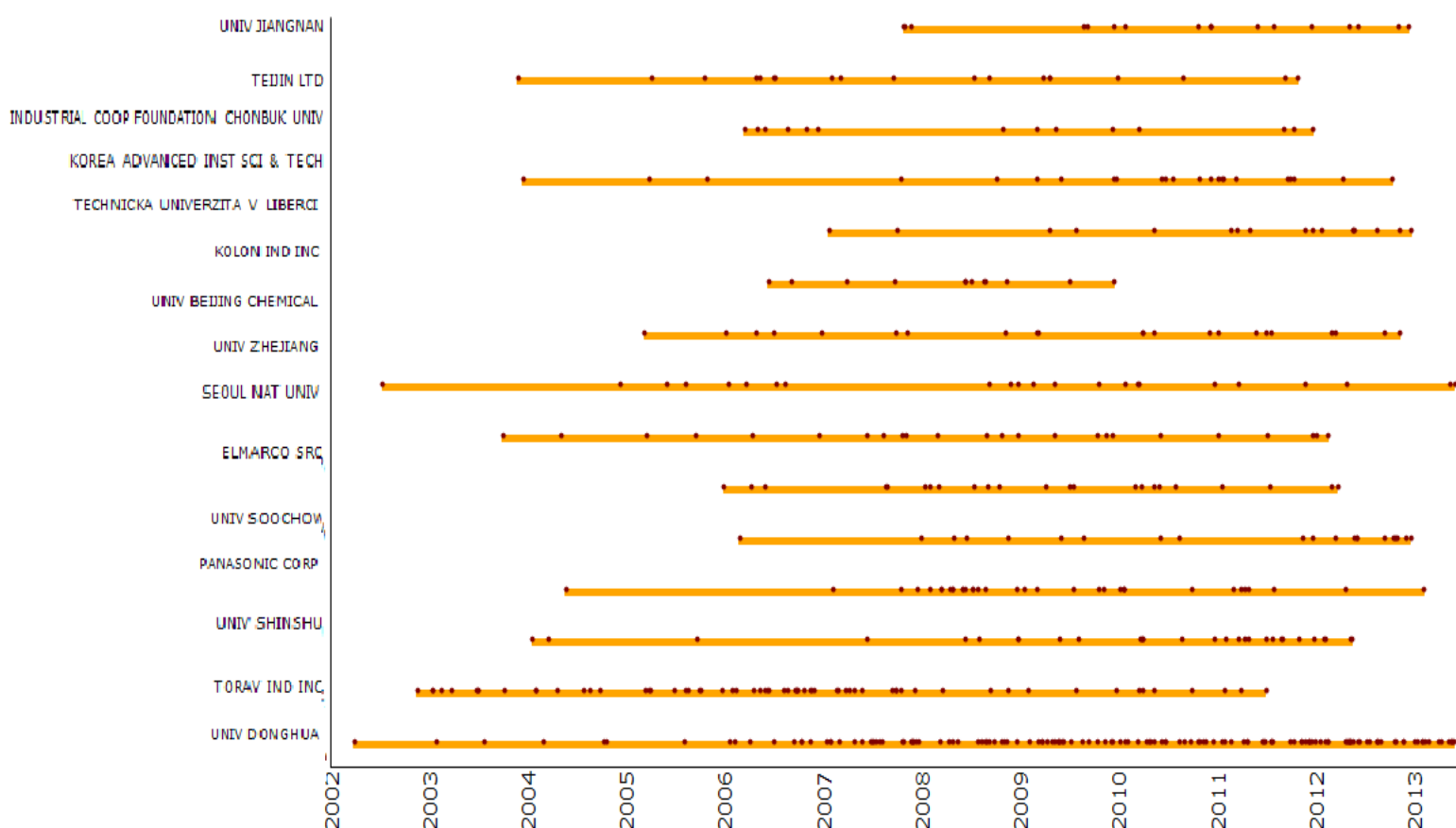
How we did it?

From the Assignee 360° report options, we selected Top 15 Assignees and the different pieces of information we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided for the same.

Companies – Innovation Timeline

With the dots representing patent filings and the orange lines indicating the timelines between the earliest and latest filings across each company, one can look into the relevance of each company with respect to time. Univ Donghua and Univ Zhejiang appear to be one of the earliest companies pursuing research across nanofabrics.

Kolon Ind began filing since 2006 but is inactive with its research even though the research around nanofabrics has increased.

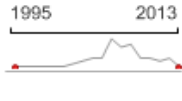












How we did it?





The dashboard tool within Patent iNSIGHT Pro was used to find the top 15 assignees within the given patent set. The innovation time chart was then generated using the Patent iNSIGHT Pro dashboard.

Inventor - Key Statistics

Here we summarize key parameters of Top 15 Inventors such as filing trend, key associated companies and top 5 co-inventors.

Inventor	Total No. of Records	Avg. No. of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Assignees (Top 5)	Co-Inventors
KIM CHAN	42 (1.3%)	0.79		2001-2012	AMOGREENTECH CO LTD(13) AMOMEDI CO LTD(13) AMO CO LTD(4) NANO TECHNICS CO LTD(3) UNIV NAT CHONNAM IND FOUND(3)	YANG SUNG CHUL(11) YANG JAE SUK(7) YUN WOO YEON(7) SEO IN YONG(5) SONG YONG SUL(5)
KIM HAK YONG	39 (1.2%)	0.79		2001-2011	INDUSTRIAL COOPERATION FOUNDATION CHONBUK NATIONAL UNIV(21) PARK JONG CHEOL(16) KIM HAK YONG(9) METABIOMED CO LTD(1) RAISIO CHEMICALS KOREA INC(1)	KIM KWAN WOO(10) PARK JONG CHEOL(9) GIL MYUNG SEOP(7) LEE KEUN HYUNG(6) GO GUN HO(5)
LIMIN ZHU	31 (1%)	0.03		2008-2012	UNIV DONGHUA(31)	DENG GUANG YU(15) XIAXIA SHEN(10) HUALI NIE(7) JING QUAN(6) SHAO FENG LOU(6)
KIM ICK SOO	25 (0.8%)	0.08		2008-2012	UNIV SHINSHU(25) TOPTEC CO LTD(19) NANBU PLASTICS CO LTD(1) TECHNOS CO LTD(1)	KIM BYOUNG SUHK(19) LEE JAE HWAN(19) WATANABE KEI(14) AKADA YAEKO(4) KIM KYU OH(4)

XIUMEI MO	25 (0.8%)	0.24		2006-2012	UNIV DONGHUA(24) UNIV JIAXING(1)	CHUANGLONG HE(8) HONGSHENG WANG(7) XIAOQIANG LI(7) YAN SU(6) KUIHUA ZHANG(4)
ISHIKAWA KAZUNOBU	21 (0.6%)	0.14		2007-2012	PANASONIC CORP(21) TOKYO INST TECH(7)	KUROKAWA TAKAHIRO(17) SUMIDA HIROTO(17) TAKAHASHI MITSUHIRO(11) TAKEZAWA MIKIO(9) TANIOKA AKIHIKO(7)
ISOGAI AKIRA	20 (0.6%)	0.75		2008-2012	UNIV TOKYO(8) JUJO PAPER CO LTD(6) NIPPON PAPER INDUSTRIES CO LTD(4) HOKUETSU KISHU PAPER CO LTD(2) UNIV KYUSHU(1)	IJIMA YUKO(10) KATSUKAWA SHIHO(10) MIYAWAKI SHOICHI(10) ABE HIROSHI(7) SAITO TSUGUYUKI(7)
KUROKAWA TAKAHIRO	20 (0.6%)	0.1		2007-2011	PANASONIC CORP(20) TOKYO INST TECH(5) KURITA WATER IND LTD(1)	SUMIDA HIROTO(18) ISHIKAWA KAZUNOBU(17) TAKEZAWA MIKIO(9) TAKAHASHI MITSUHIRO(8) TOMINAGA YOSHIKI(7)
LEE JAE HWAN	20 (0.6%)	0.1		2008-2012	TOPTEC CO LTD(20) UNIV SHINSHU(19)	KIM ICK SOO(19) KIM BYOUNG SUHK(14) WATANABE KEI(10) AKADA YAEKO(3) KIM KYU OH(3)
OCHI TAKASHI	20 (0.6%)	1.2		2003-2007	TORAY IND INC(20) JO COSMETICS KK(1)	KIDAI AKIRA(6) NARUSE YOSHIHIRO(5) NONAKA SHUICHI(5) SUZUKI NORIO(2) TAKEDA KEIJI(2)
TAKAHASHI MITSUHIRO	20 (0.6%)	0.15		2007-2012	PANASONIC CORP(19) TOKYO INST TECH(12) TAKAHASHI	TANIOKA AKIHIKO(12) ISHIKAWA KAZUNOBU(11) TAKEZAWA MIKIO(10) TOMINAGA

					MITSUHIRO(1) KURITA WATER IND LTD(1)	YOSHIKI(10) KUROKAWA TAKAHIRO(8)
KIM BYOUNG SUHK	19 (0.6%)	0		2009- 2012	UNIV SHINSHU(19) TOPTEC CO LTD(14) NANBU PLASTICS CO LTD(1)	KIM ICK SOO(19) LEE JAE HWAN(14) WATANABE KEI(14) AKADA YAEKO(4) KIM KYU OH(4)
MIYAWAKI SHOICHI	18 (0.6%)	0.56		2008- 2013	JUJO PAPER CO LTD(14) NIPPON PAPER INDUSTRIES CO LTD(4)	KATSUKAWA SHIHO(15) IIJIMA YUKO(13) ISOGAI AKIRA(10) ABE HIROSHI(8) ABE YUTAKA(7)
SUMIDA HIROTO	18 (0.6%)	0.11		2007- 2011	PANASONIC CORP(18) TOKYO INST TECH(3)	KUROKAWA TAKAHIRO(18) ISHIKAWA KAZUNOBU(17) TAKEZAWA MIKIO(9) TAKAHASHI MITSUHIRO(7) TOMINAGA YOSHIKI(7)
TANIOKA AKIHIKO	18 (0.6%)	0.11		2004- 2012	TOKYO INST TECH(16) PANASONIC CORP(15) NIPPON SUISAN KAISHA LTD(2) KURITA WATER IND LTD(1) MITSUBISHI RAYON CO LTD(1)	TAKAHASHI MITSUHIRO(12) ISHIKAWA KAZUNOBU(7) HIRATA KAZUYA(6) MINAGAWA YOSHIE(6) TAKEZAWA MIKIO(5)

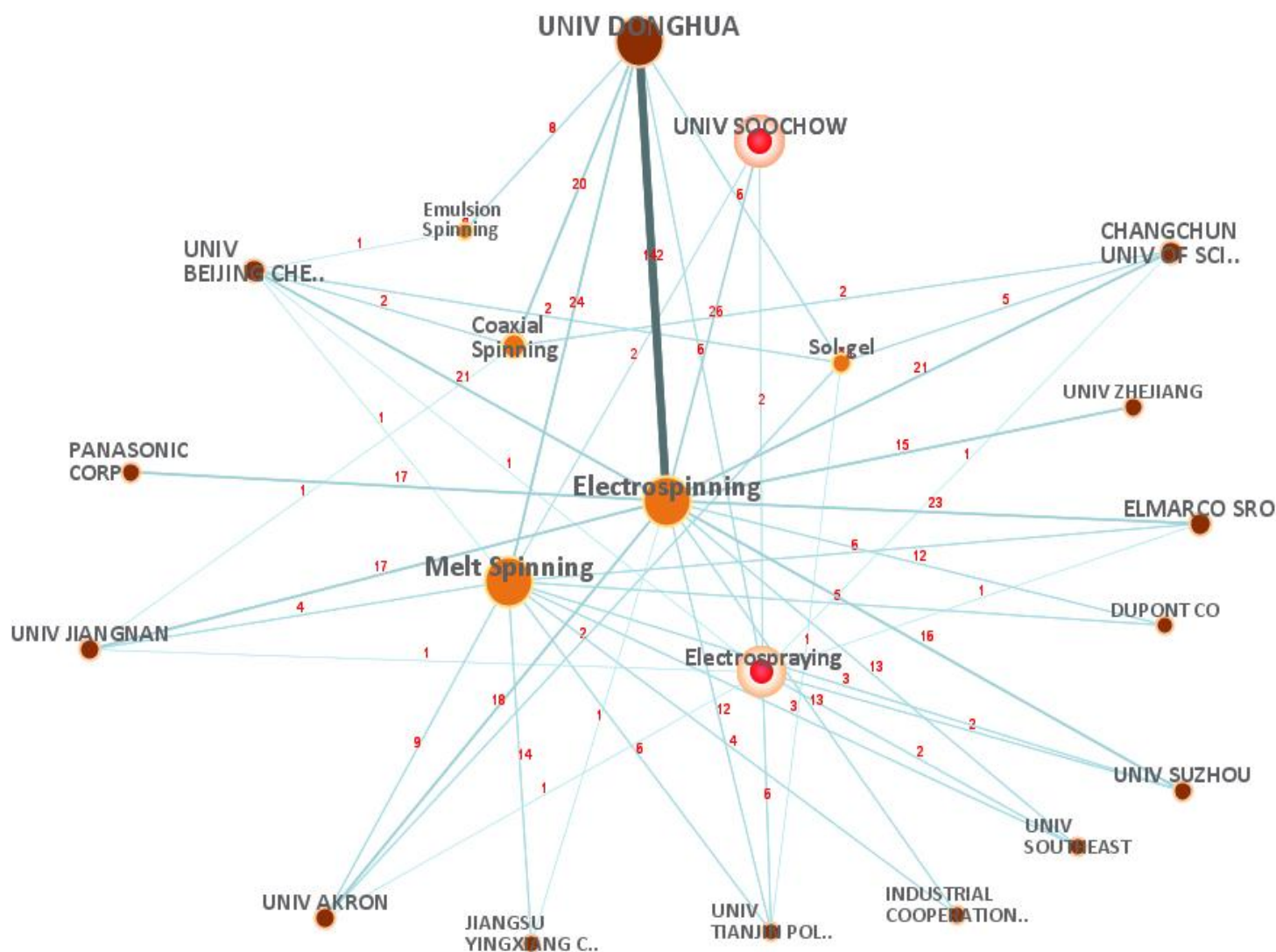
How we did it?

From the Inventor 360° report options, we selected the different pieces of information we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided for the same.

Company activity across different Processes

Which companies hold the maximum inventions across different types of processes?

Here we have correlated processes along with a listing of the key assignees in each category. In the map, each company is connected to particular technology through links whose thickness and color intensity is directly proportional to the number of records relating them. The number (in red) next to each line represents the number of records held by company present in a particular technology. It can be observed DuPont focuses only on electrospinning and melt spinning.



How we did it?

First various processes were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, records were categorized under different processes. A co-occurrence matrix was generated using the co-occurrence analyzer to map the different processes with assignees. The matrix was filtered for the top 15 Assignees and finally the matrix was converted into the above Correlation map using an option provided in software for the same. Also, links between same field types were removed using the option provided.

Nanofabrics - Companies vs Applications

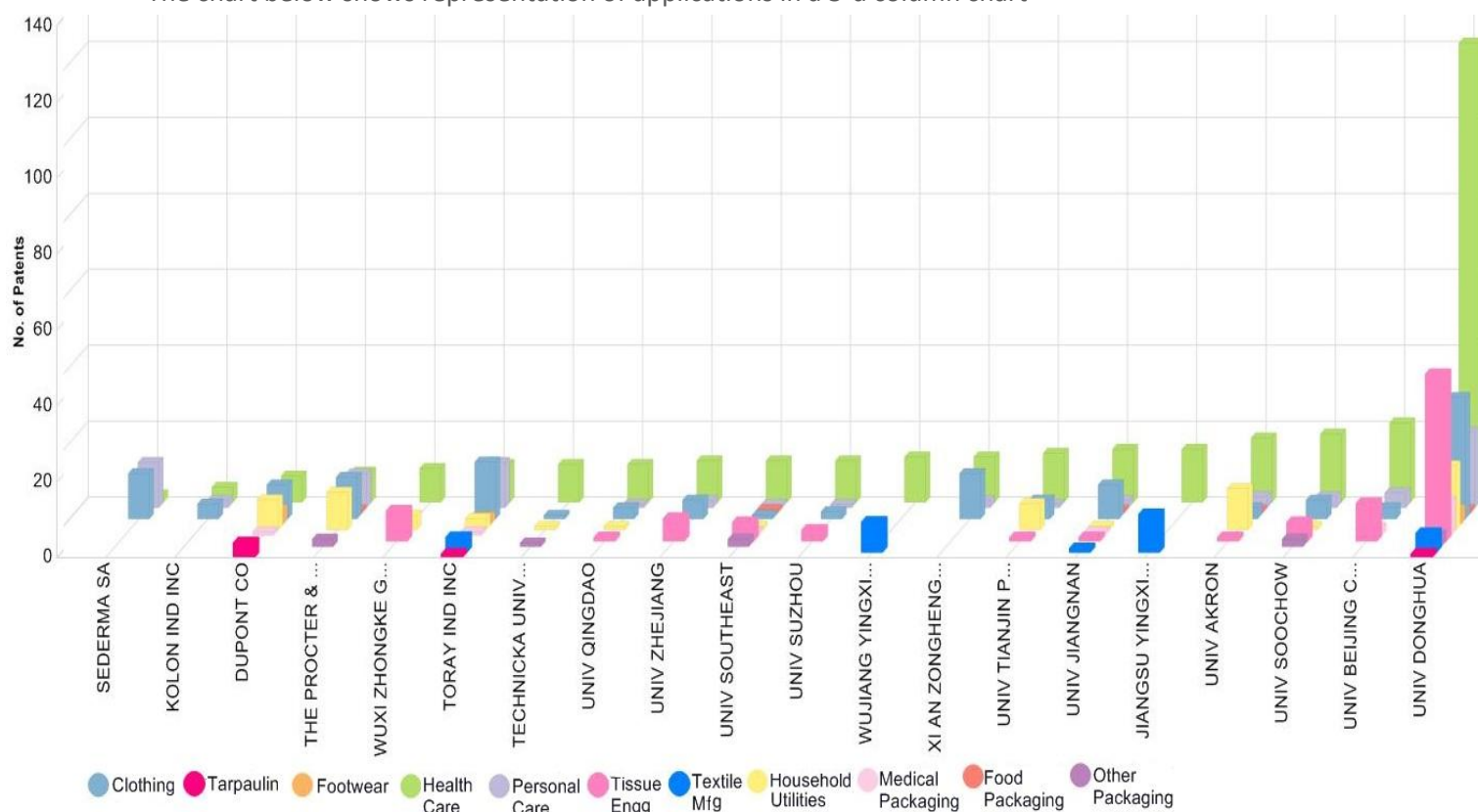
Which assignees hold the maximum inventions across different nanofabric applications?

In the below matrix leading patent holdings within key application areas have been highlighted with stronger shades of orange for large number of patents within that category. Jiangsu Yingxiang Chemical Fibre Co Ltd focuses more towards Textile Manufacturing as compared to Univ Donghua which is active in other application areas.

Applications (Columns)									
Companies (Rows)	Total	Health Care	Personal Care	Food Packaging	Clothing	Household Utilities	Medical Packaging	Tissue Engineering	Textile Manufacturing
Total	420	332	74	4	127	61	16	89	28
UNIV DONGHUA	141	121	20	1	32	17	9	44	5
TORAY IND INC	28	10	12		15	3	1		4
UNIV SOOCHOW	22	18	3		5	1		5	
UNIV BEIJING CHEMICAL	21	21	4		3		2	10	
UNIV JIANGNAN	19	14	2	1	9	1	1	1	1
UNIV AKRON	17	16	3		3	10		1	
UNIV ZHEJIANG	15	10	2		4			5	
UNIV SOUTHEAST	15	11	1	1	1	1	1	5	
JIANGSU YINGXIANG CHEMICAL FIBRE CO LTD	14	14							10
WUJIANG YINGXIANG WANXIN CHEMICAL FIBER CO LTD	13	12							8
UNIV TIANJIN POLYTECHNIC	13	12	1		4	6			
DUPONT CO	13	7			9	8	1		
XI AN ZONGHENG TEXTILE TECHNOLOGY CO LTD	12	12	2		12				

THE PROCTER & GAMBLE CO	12	8	9	1	11	10			
SEDERMA SA	12	2	12		12				
WUXI ZHONGKE GAUNGYUAN BIOLOG MATERIAL CO LTD	11	9				4		8	
UNIV SUZHOU	11	11	1		2			3	
TECHNICKA UNIVERZITA V LIBERCI	11	10			1				
UNIV TIANJIN	10	10					1	7	
KOLON IND INC	10	4	2		4				

The chart below shows representation of applications in a 3-d column chart



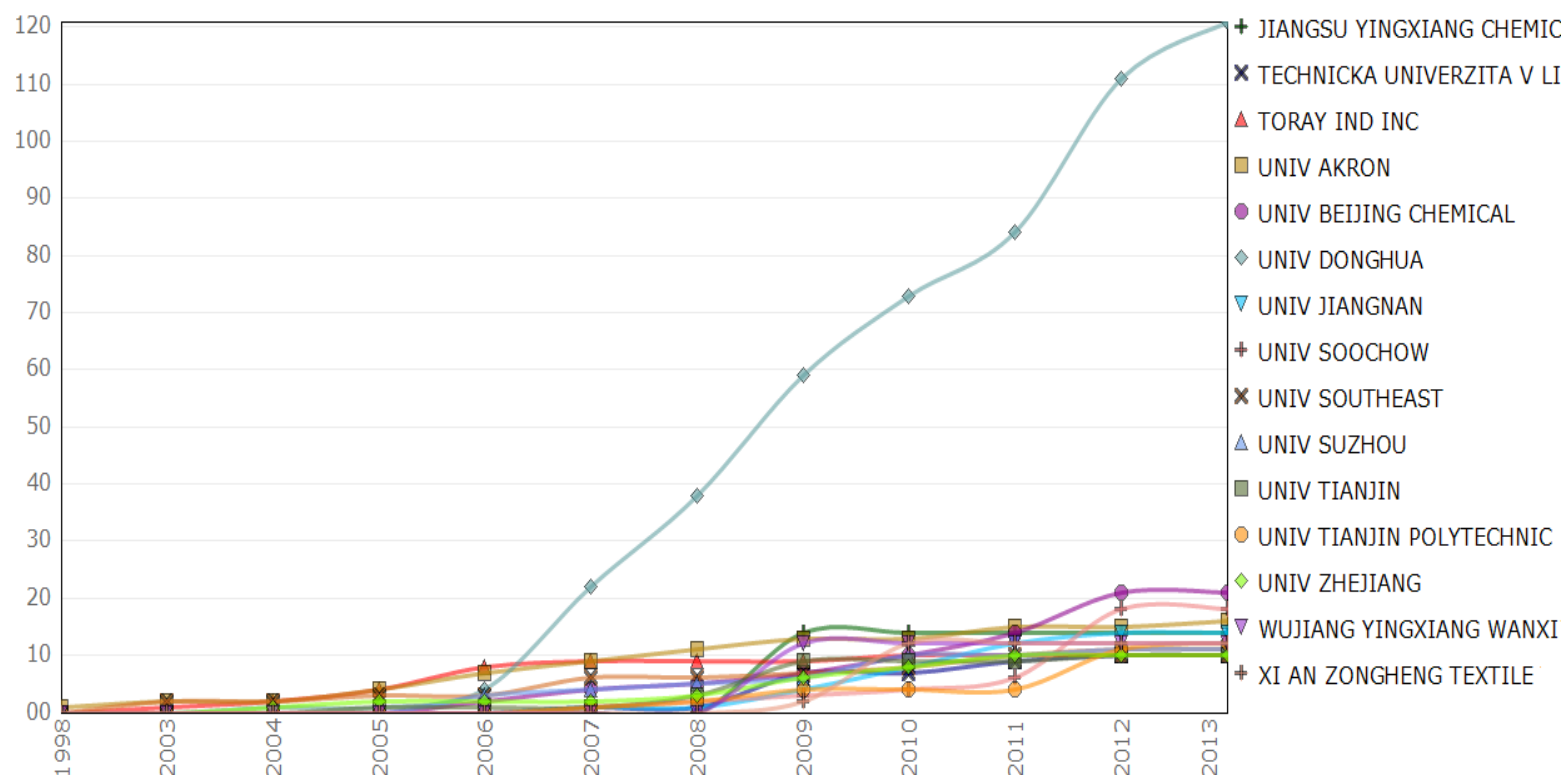
How we did it?

First various applications were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, records were categorized under different applications. A co-occurrence matrix was generated using the co-occurrence analyzer and the resulting matrix was converted to a 3-d column chart.

Nanofabrics – Application Wise Research Trends

Health Care: Filing Trend

- The below trend chart represents the filing trends for top 15 companies
- The blue trend line associated with Univ Donghua shows an impressive spike from 2006 onwards

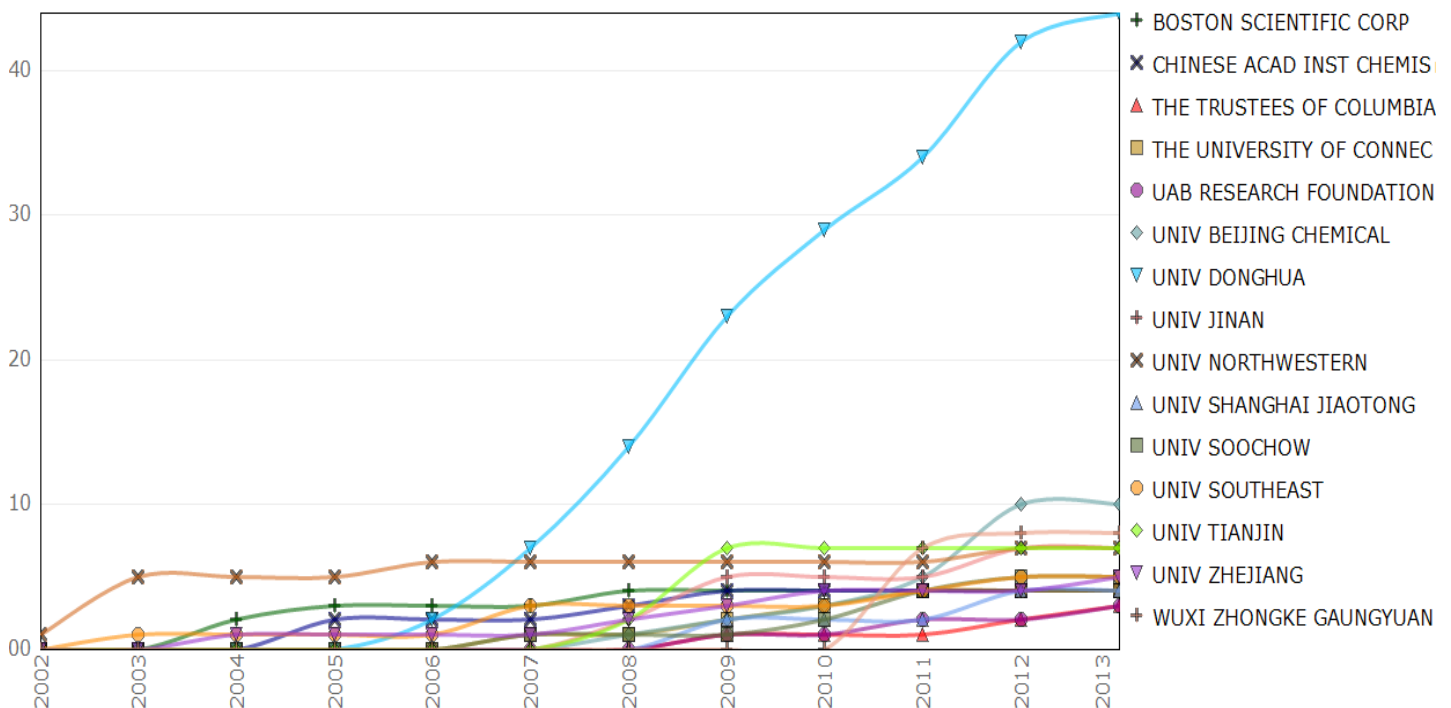


How we did it?

We selected health care as user defined cluster from filter option within Reports Dashboard. The line graph showing the cumulative filings of top 15 assignees with respect to time was created.

Tissue Engineering: Filing Trend

- The below trend chart represents the filing trends for top 15 companies
- It can be seen that Univ Northwestern and Univ Donghua had equal number of records in 2007; there has been increase in number of filings for Univ Donghua since then

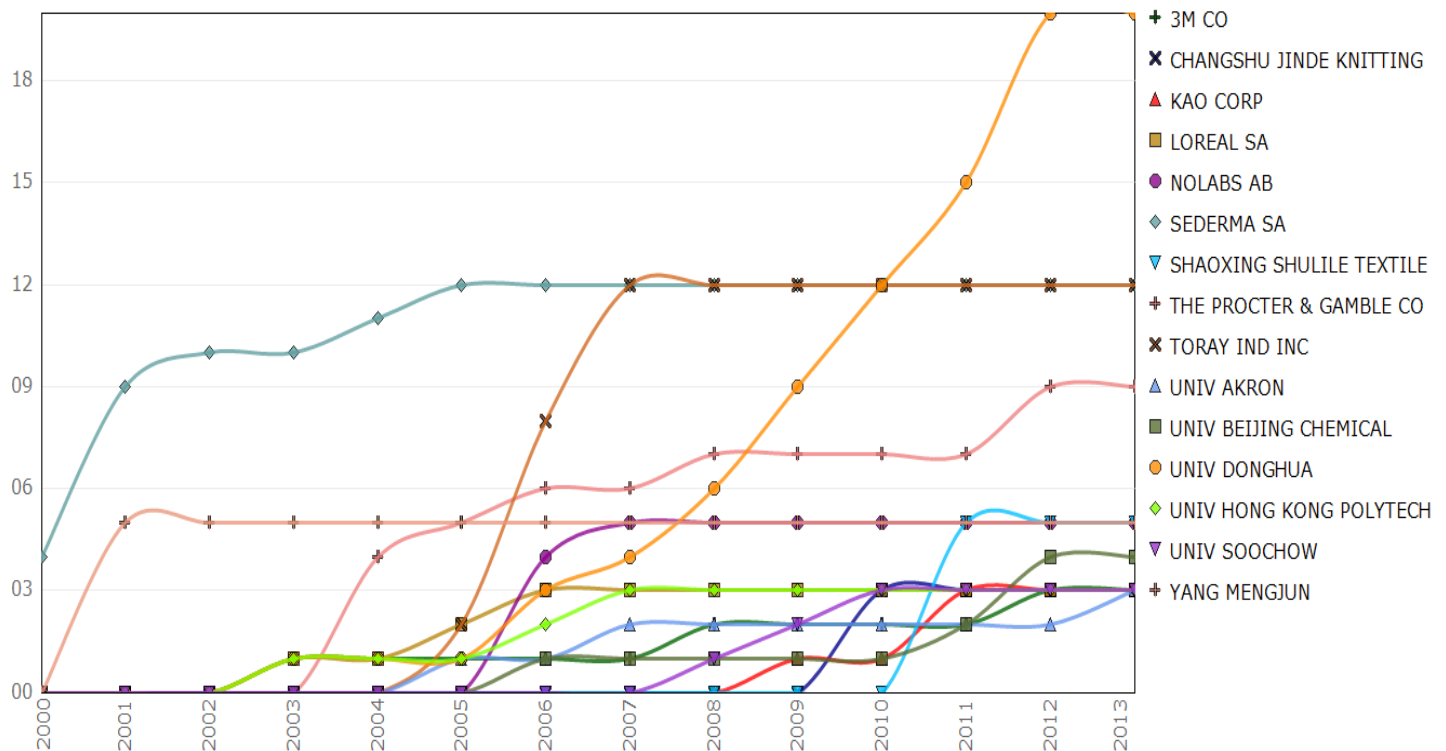


How we did it?

We selected tissue engineering as user defined cluster from filter option within Reports Dashboard. The line graph showing the cumulative filings of top 15 assignees with respect to time was created.

Personal Care: Filing Trend

- The below trend chart represents the filing trends for top 15 companies
- P&G shows a constant growth since 2003

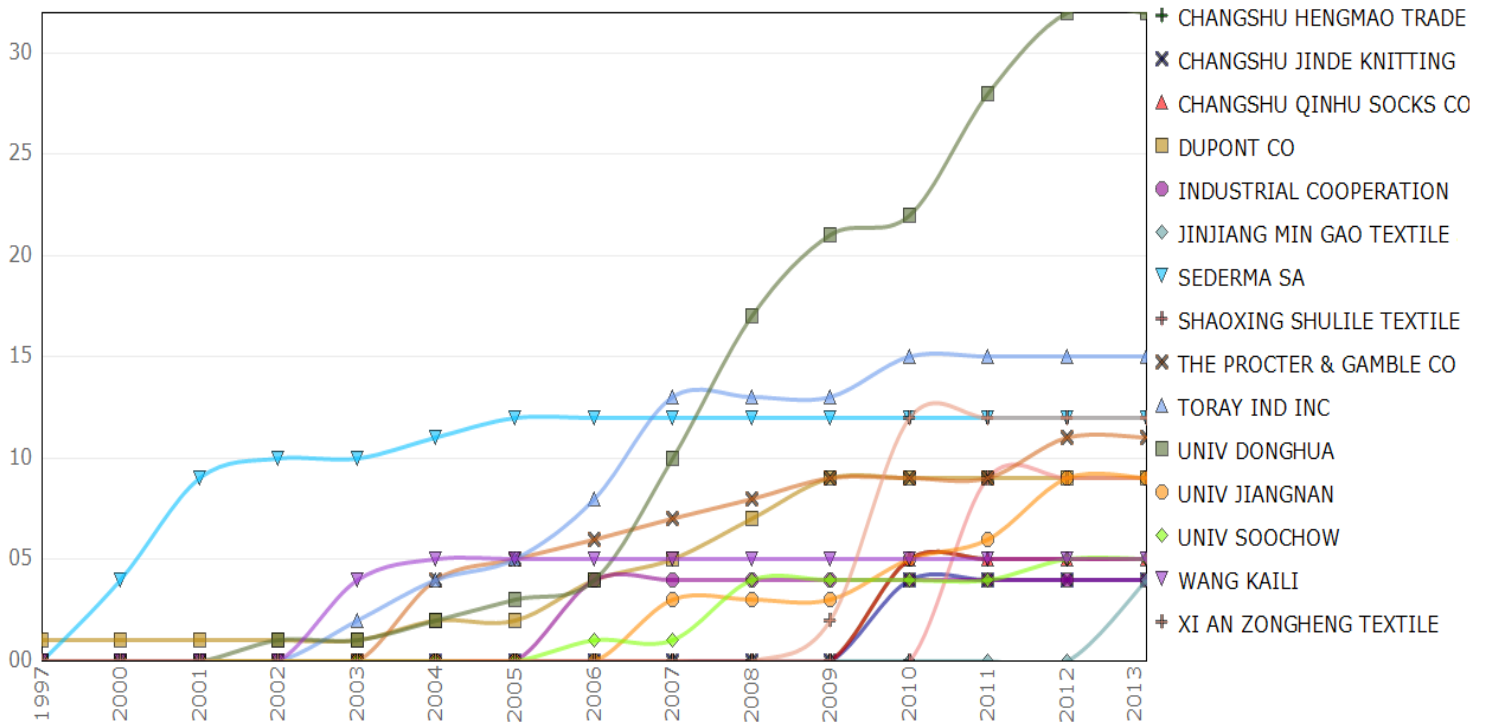


How we did it?

We selected personal care as user defined cluster from filter option within Reports Dashboard. The line graph showing the cumulative filings of top 15 assignees with respect to time was created.

Clothing: Filing Trend

- The below trend chart represents the filing trends for top 15 companies
- Toray Ind shows constant growth since 2002



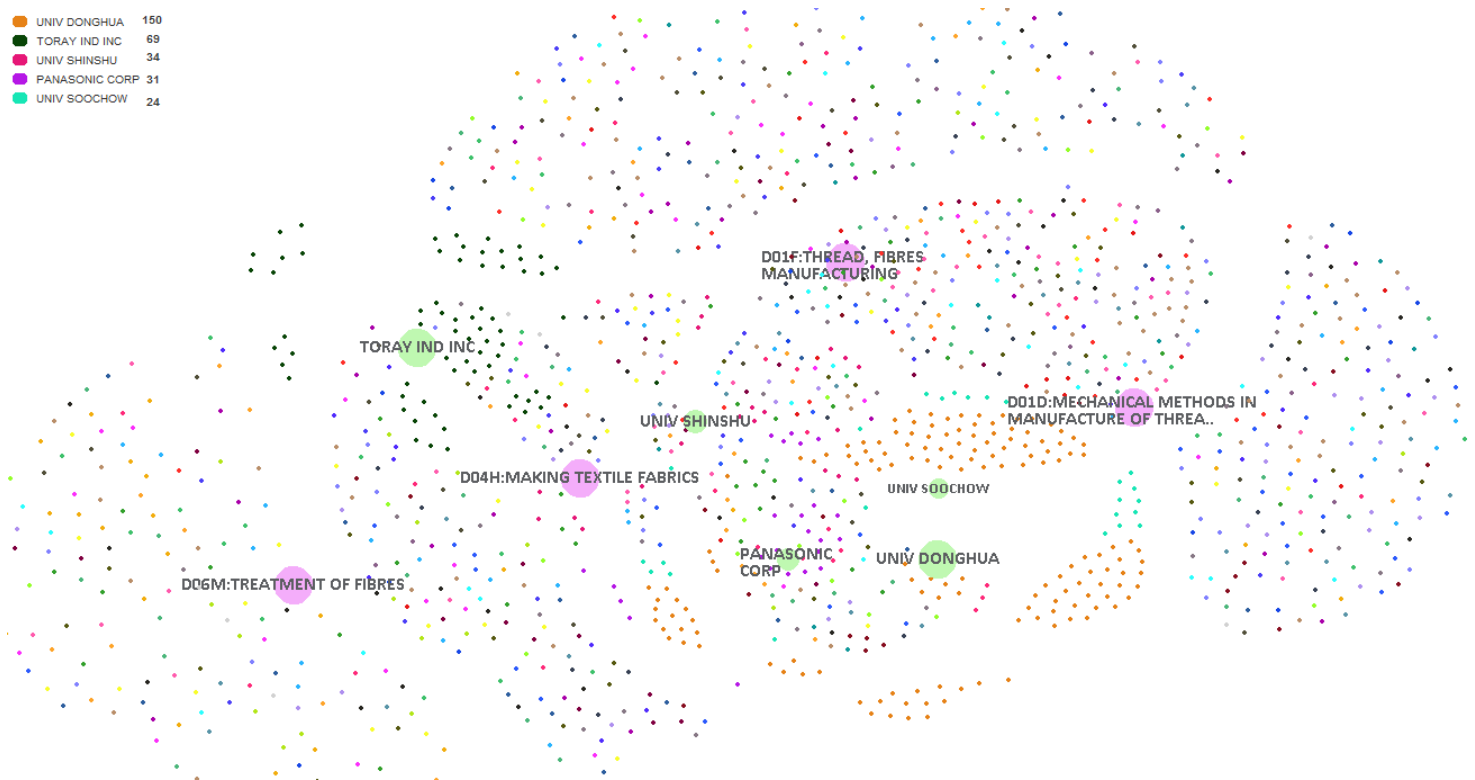
How we did it?

We selected clothing as user defined cluster from filter option within Reports Dashboard. The line graph showing the cumulative filings of top 15 assignees with respect to time was created.

Sample Portfolio Comparison of top companies

How does the portfolio landscape of Univ Donghua compare with other companies?

The map shows patents of top five assignees clustered together based on the basis of key IPC.



How we did it?

Records for key IPC for the period 2011-2013 were loaded using the options within VizMAP and filtered by key companies using the Analyze By option present in VizMAP. The companies were highlighted with different colors.

Technology Landscape for Nanofabrics

The contour map below represents different processes & technologies used in nanofabric production with respect to complete patent portfolio. The nodes were colored by companies.



How we did it?

The VizMAP tool in Patent iNSIGHT Pro was used for this analysis. First the clusters for different processes were loaded on the map. They were analyzed on basis of their contextual similarity based on title, abstract and claims. We removed unrelated patents using the “Hide Unrelated records” option and one patent assignee using the options available in VizMAP.

Nanofabrics: Processes vs Applications

The below matrix shows different processes used across different applications. It can be seen Melt Spinning is primarily used in textile manufacturing and footwear. Sol-gel is used more in health care industry as compared to other industry.

Processes (Column)	Total	Melt Spinning	Electrospinning	Electrospraying	Sol-gel	Coaxial Spinning	Emulsion Spinning
Applications (Rows)							
Total	932	208	814	71	38	45	15
Health Care	787	156	703	63	34	43	15
Clothing	257	102	205	14	5	8	1
Tissue Engineering	231	17	222	24	7	18	9
Household Utilities	170	63	144	20	1		
Personal Care	138	45	118	11	6	4	3
Medical Packaging	40	9	35	2	2	7	4
Textile Manufacturing	37	23	19	2			
Footwear	36	20	18	1	1	2	
Other Packaging	22	6	17	2			
Food Packaging	15	6	12	1	1		
Tarpaulin	12	3	9	1			
Cover	1		1				

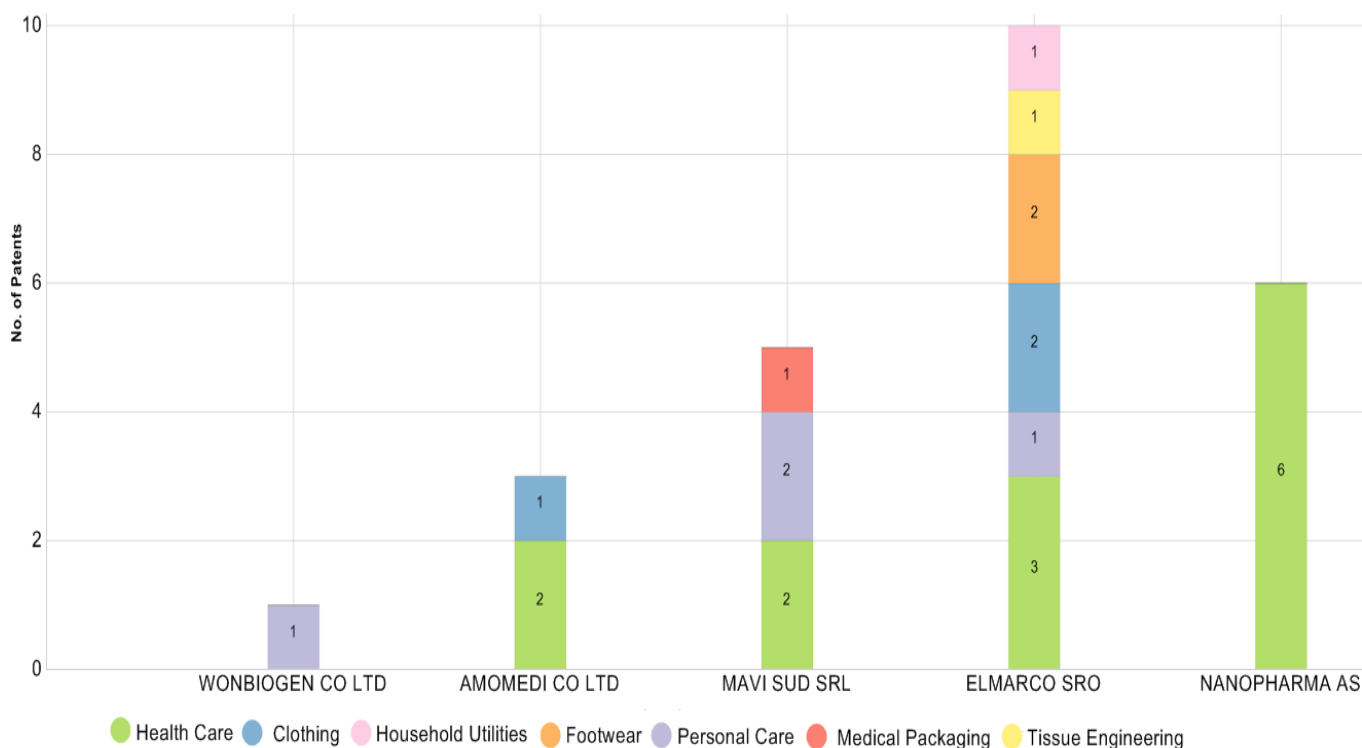
How we did it?

The clusters that were created for the analysis were correlated using the co-occurrence analyzer and resulting matrix was exported to Excel using the option provided for the same.

Company Research across applications and processes

Applications:

- Nanopharma for focuses only on health care; Wonbiogen focuses only on personal care
- Elmarco is active across all application areas

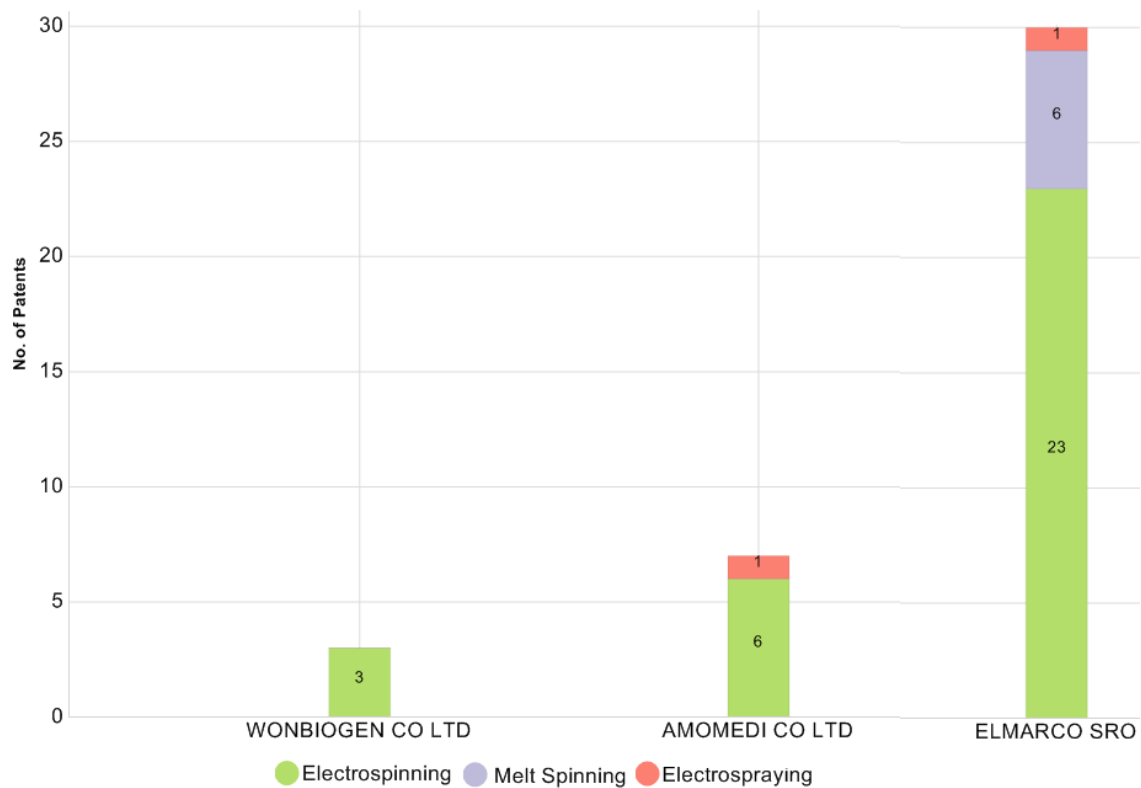


How we did it?

We first created a group for unique companies focusing only on nanofabrics using auto filter option. Using co-occurrence analyzer, we used that group as data filter to generate a matrix for those companies with respect to applications and resulting matrix was converted to a stacked column chart.

Processes:

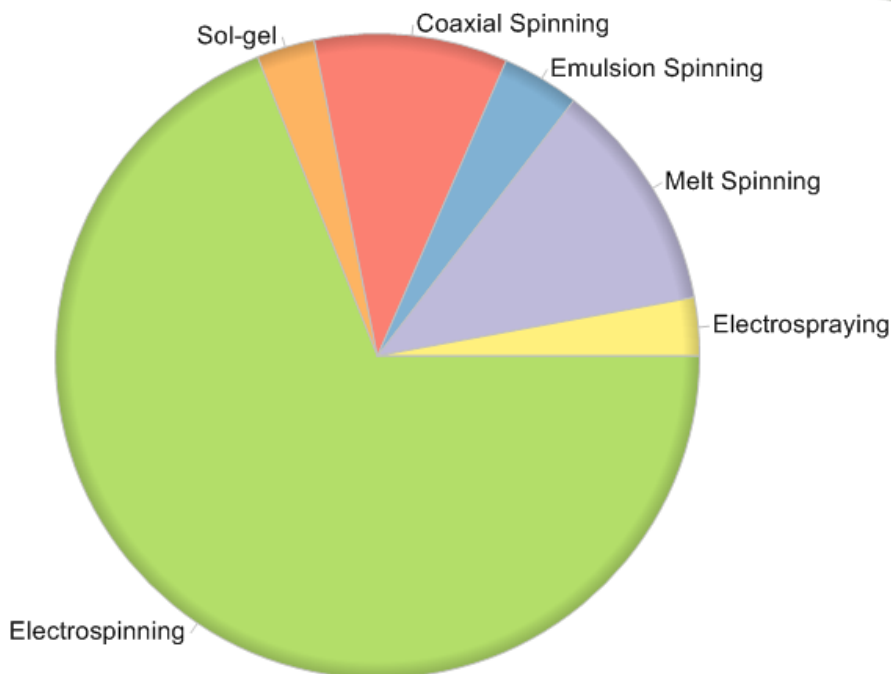
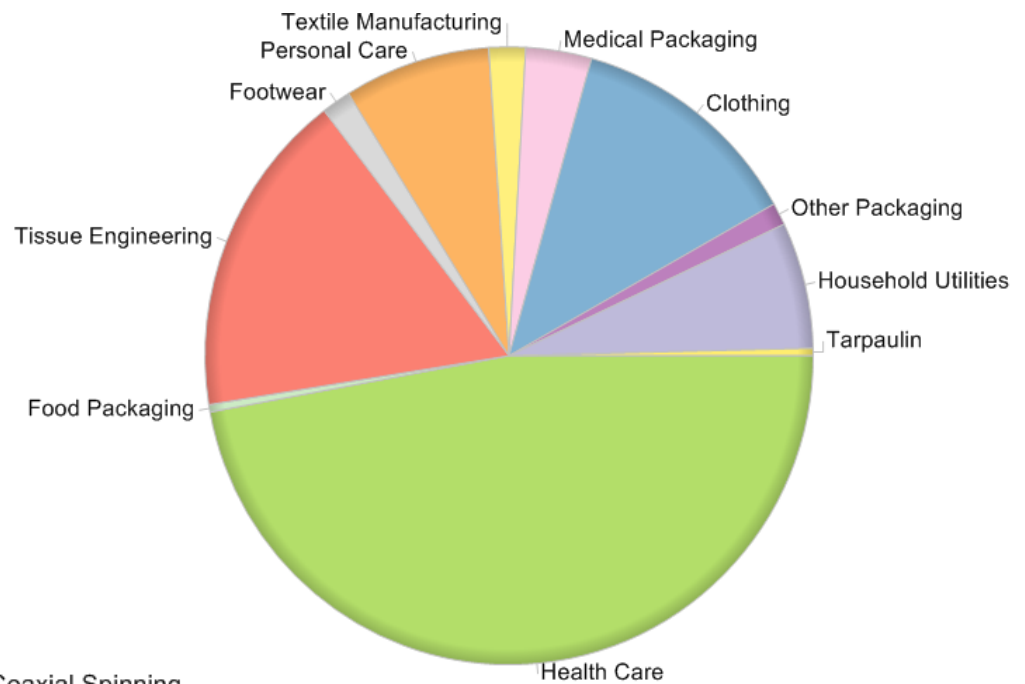
- Companies like Mavi Sud and Nanopharma are not active in any of the processes



How we did it?

The group of unique companies created for previous analysis was correlated along with different processes using the co-occurrence analyzer and resulting matrix was represented as a stacked column chart.

Univ Donghua: Focus Across Key Applications and Processes



How we did it?

Using co-occurrence analyzer, we filtered Univ Donghua, and correlated the assignee with applications and processes respectively. The resulting matrix was converted to a pie chart.

Appendix: Search Strings Used for Categorization

Categorization: Applications

1. Clothing

Clothing	
(FT) contains (gloves or jacket* or sweatshirt* or pullover* or sweater* or cloth* or vest* or shirt* or shorts or trousers or aprons or pants or hats or gauntlets or garment*)	621 results

2. Cover

Cover	
(FT) contains ((wheel* or "gear* shift*" or "head rest*" or seat* or handle* or handel*) w/3 cover*)	4 results

3. Food Packaging

Food Packaging	
(FT) contains ((food* or snack* or beverage* or seasoning* or sauc* or confection* or baker* or dairy* or dessert*) w/10 (pack*))	19 results

4. Footwear

Footwear	
(FT) contains (hosier* or footwear* or shoes or boots or sneaker* or stocking* or socks)	88 results

5. Health Care

Health Care	
(FT) contains ((Drug* w/3 (Deliver* or inject* or formulat* or releas* or administ*)) or (topical w/2 (administ* or medication)) or syringe* or injection* or medic* or pharma* or antiseptic* or infection* or infected or healthcare* or health-care* or "health care" or biomedic* or crepebandage* or "crepe bandage*" or bandage* or dental* or (wound* w/2 (dressing or care* or heal*)))	1325 results

6. Household Utilities

Household Utilities	
(FT) contains (pillow* or quilt* or towel* or rugs or mats or carpet* or cushion or cushions or tablecloth* or blanket* or curtain* or (bed* w/1 (linen* or cover*)) or bedding* or comforters or comfortors or wipes or napkin*)	324 results

7. Medical Packaging

Medical Packaging	
(FT) contains ((pharma* or tonic* or medic* or drug* or healthcare* or capsule* or pill or pills or tablet* or ointment* or excipient* or syringe* or injection) w/10 (pack*))	55 results

8. Other Packaging

Other Packaging	
(FT) contains (pack*) and not (food* or snack* or beverage* or seasoning* or sauc* or confection* or baker* or dairy* or dessert* or pharma* or tonic* or medic* or drug* or healthcare* or capsule* or pill or pills or tablet* or ointment* or syringe* or excipient* or injection or health-care* or "health care")	50 results

9. Personal Care

Personal Care	
(FT) contains (cosmetic* or toiletry or toiletries or sunscreen* or "personal care" or "lip balm" or "cleansing pads" or colognes or "cotton swabs" or "cotton pads" or "oral hygiene" or deodorant* or "eye liner" or "facial tissue" or "hair clippers" or "lip gloss" or lipstick* or lotion or mouthwash or "mouth wash" or "nail files" or pomade or perfume* or razors or shampoo or soap or conditioner* or "talcum powder" or "shaving cream*" or "skin cream*" or "toilet paper" or "wet wipes" or toothbrush* or toothpaste* or cleanser* or cleansing or personal-care* or personalcare* or shampoo* or mouthwash* or "hand wash" or handwash* or "oral care" or "skin care" or skincare* or oral- care* or skin-care* or sun-screen or sunscreen* or "sun screen*" or "sunburn cream" or "sun cream" or moisturizer* or emollient* or ((cosmetic* or skin or beauty) w/2 (lotion* or gel* or cream*)))	317 results

10. Tarpaulin

Tarpaulin	
(FT) contains ("sleeping bag*" or canopy or "sun roof" or tarpaulin or tarp* or tent or tents or backpack* or rucksack* or knapsack* or packsack* or hootch* or polytarp* or "travel blanket*" or sleepingbag*)	28 results

11. Textile Manufacturing

Textile Manufacturing	
(FT) contains (textile* w/2 manufactur*)	58 results

12. Tissue Engineering

Tissue Engineering	
(FT) contains (tissue* w/2 engineer*)	293 results

Categorization: Processes

1. Coaxial Spinning

Coaxial Spinning	
(FT) contains (coaxial* w/2 spin*)	53 results

2. Electrospinning

Electrospinning	
(FT) contains (electrospin* or (electro* w/2 spin*) or electrostatic* or "electro* spun*" or electrospun*)	1247 results

3. Electrospaying

Electrospaying	
(FT) contains (electrospray* or (electro* w/2 spray*))	88 results

4. Emulsion Spinning

Emulsion Spinning	
(FT) contains (emulsion* w/2 spin*)	17 results

5. Melt Spinning

Melt Spinning	
(FT) contains (melt* w/2 spin*)	249 results

6. Sol-gel

Sol-gel	
(FT) contains "sol gel" or "sol* gel*"	51 results

Summary

This report categorizes and graphically analyzes research trends around nanofabrics and the processes involved and its applications from various perspectives and highlights the key companies involved.

The use of nanoparticles and nanofibers to produce specialized nanofabrics became a subject of interest after the sol-gel and electrospinning techniques were fully developed in the 1980s. Since 2000, dramatic increases in global funding have accelerated research efforts in nanotechnology, including nanofabrics research.

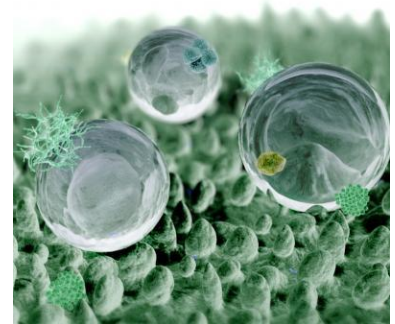


Image source:

http://cnl.colorado.edu/cnl/index.php?option=com_content&view=article&id=230&Itemid=174

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Sources & References

<http://en.wikipedia.org/wiki/Nanofabrics>
<http://en.wikipedia.org/wiki/Nanofiber>
<http://en.wikipedia.org/wiki/Electrospinning>
<http://en.wikipedia.org/wiki/Electrospray>