The 28th Regional Cluster Seminar

<Technology Fair>

Project to Create Manufacturing Industries in the Tokai Region

Dec. 19th, 2007

TOYOTA CENTRAL R&D LABS., INC.

<Targets >

We, TOYOTA CRDL present our original technologies and patents to KYOHOKAI and member companies of Tokai Manufacturing Industry Creation. The provided technologies are from various fields (e.g. material, processing, environment, bio-technology, measurement & analysis, equipment, and software) and are already put to practical use, but still remaining of expandable potential. Through this Technology Fair, TOYOTA CRDL contributes to the vitalization and development of regional industries by the practical technologies and patents that belong to us.

<Results>

1.Holding of Fair：	Feb. 2003 ~	Tokai Manufacturing Industry Creation Council	6 times
	Dec. 2004 ~	Kinki Techno Matching Fair	3 times
	Jul. 2006 ~	Hokuriku Technology Fair	1 time
2. Achievement：	become effective and contract of technology		
		（include individually Technology Fair）	20cases
	under evaluating technology		
		（ include individually Technology Fair ）	23cases

Technology Fair

1/2

date	subject	(Companies/persons)
2003/Feb	KYOHOKAI	140 / 896
	Tokai Manufacturing Industry Creation Council	49 / 73
2003/Sep	Tokai Manufacturing Industry Creation Council	43 / 72
2004/Feb	KYOHOKAI	73 / 139
	Tokai Manufacturing Industry Creation Council	68 / 97
2004/Oct	KYOHOKAI	72 /137
	Tokai Manufacturing Industry Creation Council	68 / 113
2004/Dec	Kinki Techno Matching Fair 2004	46 / 64
2005/Sep-Oct	Technology fair for Gifu-industry 2005	ー / 100
2005/Oct	KYOHOKAI	81 / 145
	Tokai Manufacturing Industry Creation Council	64 / 103
2005/Oct	Patent distribution fair in Chubu 2005	ー / 200
2005/Oct	Kinki Techno Matching Fair 2005	44 / 50
2005/Dec	SANGAKUKAN Technology Matching Fair 2005	ー / 300
2006/Jan	tour the Toyota CRDL (Gifu-Industry Associates)	20 / 24

date	subject	personnel
7 / 2006	Hokuriku Manufacturing Industry Council (at Kanazawa)	80
9 / 2006	Bio Japan 2006（at Osaka）	300
10/ 2006	KYOHOKAI	116
	Tokai Manufacturing Industry Creation Council（TOYOTA CRDL）	105
10/ 2006	SANGAKUKAN Technology Matching Fair 2006（at Tokyo）	300
10/ 2006	Environmental fair（ at Nagoya Port MESSE)	350
11/ 2006	Frontier of Technology in Chubu 2006	250
11/ 2006	Chubu Economic Federation Technology Fair 2006	100
11/ 2006	Patent Fair in Kinki（at INTEX-OSAKA)	150
12/ 2006	Kinki Techno Matching Fair 2006	60
1 / 2007	Greater Nagoya cluster forum 2007	200
4 / 2007	Fukui pref. Industry technology center fair	60
6 / 2007	Bio EXPO 2007（at Tokyo）	300
7 / 2007	Hokuriku Manufacturing Industry Council (at Kanazawa)	60
9 / 2007	MESSE Nagoya 2007（at Nagoya Port MESSE)	300
10/ 2007	Tokai Manufacturing Industry Creation Council（TOYOTA CRDL ）	160
11/ 2007	Kinki Techno Matching Fair 2007（at Osaka）	100

Joint development

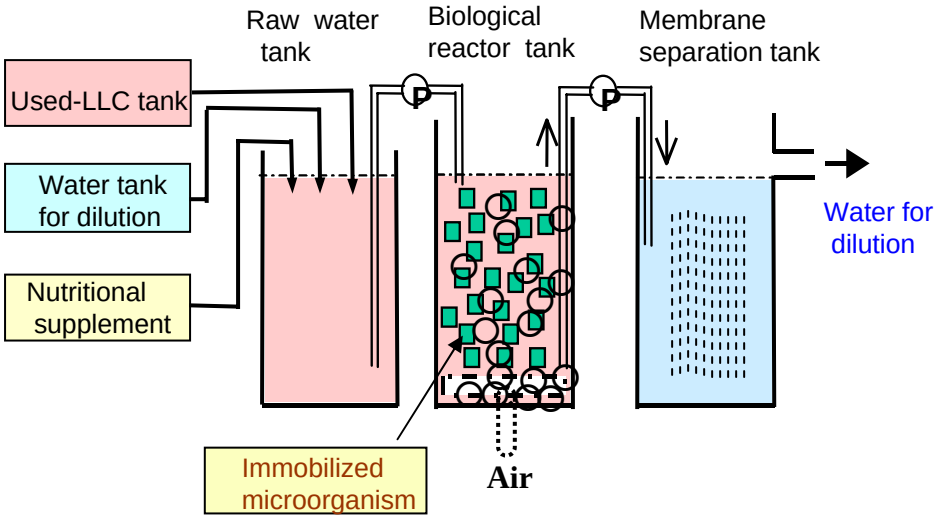
as of 2007/12

technology	technology transfer	background	present
Negative ion	Fukukaen Nursery & Bulb Co., Ltd.	differentiated cultivation technology	Under development
	KOJIMA PRESS INDUSTRY CO., Ltd.	new business	Under evaluation
A Treatment Plant with Biodegradation for Used-LLC Automobile	TOYOKIN Co., Ltd.	Visualized environmental operation	commercialize
	MEIDENSYA Co., Ltd.	new business	generalize
Porosity of Aluminum Alloy Castings	TALKENG Co., Ltd.	business field expansion	put into market
Index of Psychosomatic Stress Response	Medical ＆ Biological Laboratories Co., Ltd.	new product development	Under development
	Pokka Corporation	Quantitative analysis & sales expansion	now underway
Folded Sheet Mesoporous materials	TAIYO KAGAKU Co., Ltd.	technology transfer	Under evaluation
Gum metal	TACMINA CORPORATION	spur technologic innovations	Under evaluation
	TECHNO TAKATSUKI CO., Ltd.	spur technologic innovations	Under trial production
Aeration Powder Filling Method	SHIBUYA KOGYO CO.,LTD.	spur technologic innovations	Under trial production
Supercritical Fluids (CO2)	RyuSyo Industrial Co., Ltd.	creasing use & sales expansion	now underway
Aroma negative ion	Hitachi House Tec Co., Ltd. TOHO GAS Co., Ltd.	new product development	Under trial production

The Pilot Plant for Microbiological Treatment of Waste Automotive Engine Coolant(LLC)

Features

- Ethylene glycol(EG) degrading bacteria was isolated from a soil sample.
- Bacteria is immobilized in polyvinyl alcohol.
- Bacteria was capable of degrading 100% of the EG contaminated waste water within a day.



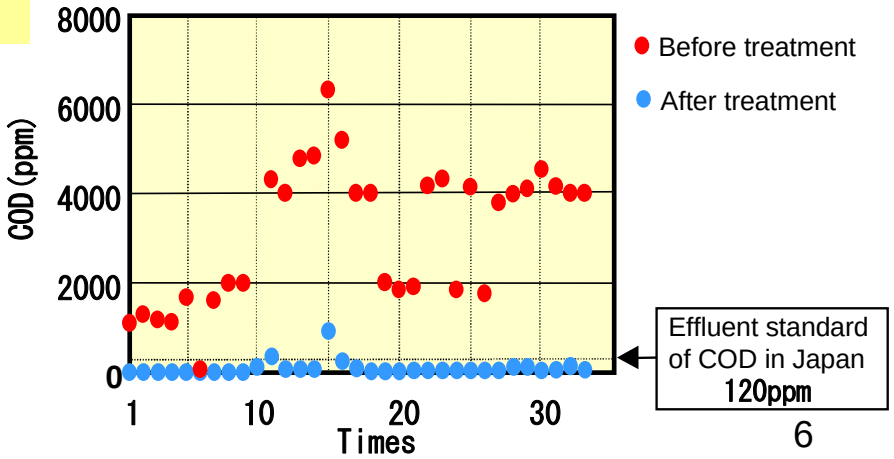
Application

- Car dealer, Automotive dismantling plant, Gasoline stand, automobile repair plant, etc

JPC : No,3414618

COD : Chemical Oxygen Demand

Result



トヨキン殿へ微生物処理プラント導入

Evaluation results for a long time showed that the plant on 300L/day scale at Toyokin Auto-Plaza Co. has been almost completely capable of degrading concentrated ethylene glycol, which is the major constituent of LLC.

Continuous process combined fluidized bed method with polyvinyl alcohol- immobilized LLC- degrading bacteria and activated sludge method with membrane separation

2005年10月完成

最終処理槽内で鯉・モロコを飼育中
⇒2年以上経過、異常なし

2007年2月より産廃処理事業開始
新事業創出

Toyokin Auto-Plaza Co.

The Key of success for Technology transfer of LLC

1.TOYOTA CRDL (business development)

：expert opinions , belief, group sharing

・shifted from a technology that was abandoned by researchers to own worthwhile
・have strong relationships with specialized manufacturers of biotechnology
⇒cooperation between various industries
・the sympathy for the attitude toward technology innovation in the transferred company made cooperative and supportive system
・backup support systems by researchers

2. TOYOKIN group（top executive ）：ambition 、bold decision

・the high level of interest in environmental business as a company for the recycling
・positive about technology transfer
・strong sense of trust TOYOTA CRDL (technology and person)
・endurance 、decision 、leadership
・plentiful managerial resources⇒ provide enough manpower, supplies and funds

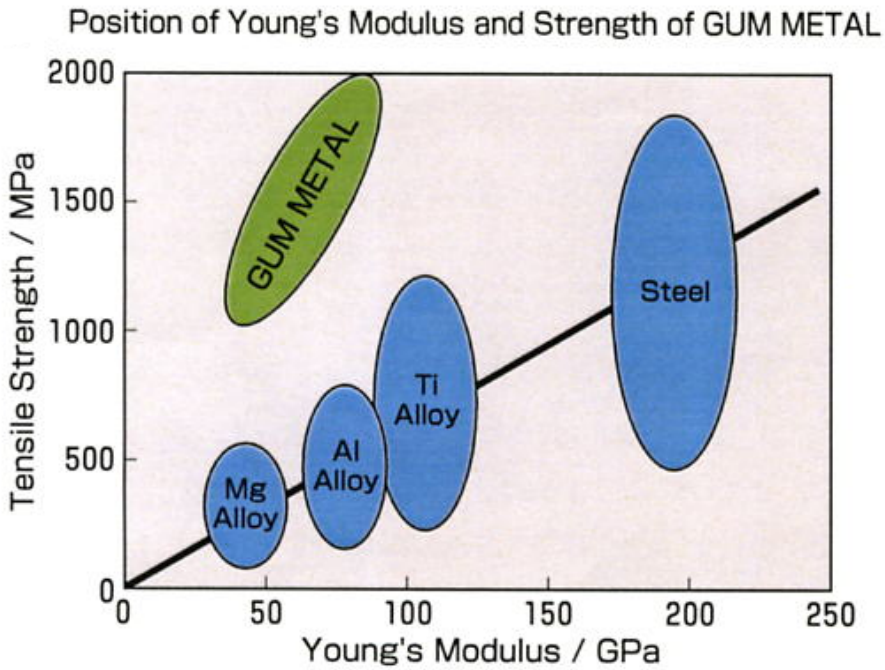
3. Meidensha Corp.（development ）：sense of responsibility 、patience

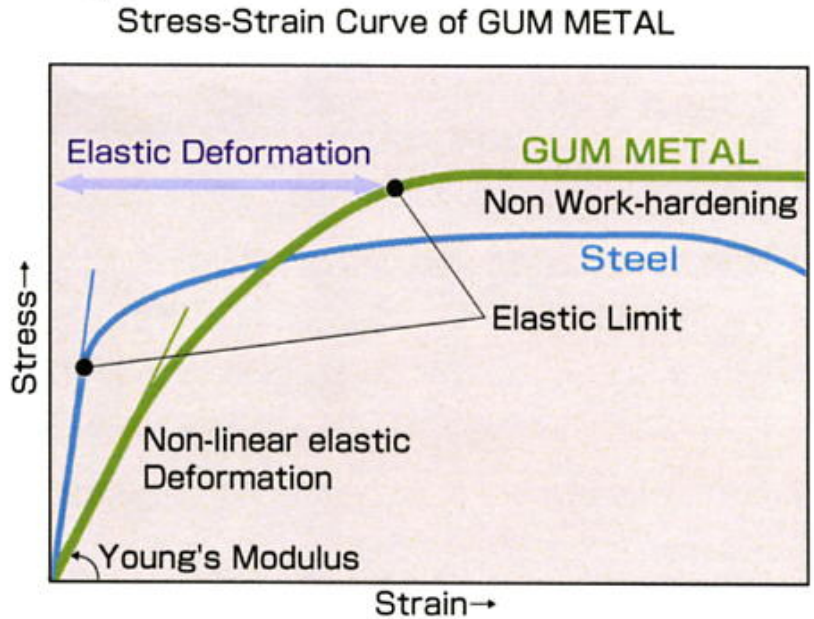
・ambition for new business（get in operation environmental business ）
・ trusting relationship to TOYOTA CRDL and keep good relationship
・staffs have a great ambition, responsibility and patience

Super Elasto-plastic Titanium Alloy -GUM METAL-

Elasto-plastic metal is an entirely new titanium alloy having low Young's modulus and high strength that cannot be obtained from conventional metallic materials

Low Young's modulus⇒Ti_3(Ta + Nb + V)
high strength⇒(Zr、Hf)+O、cold working

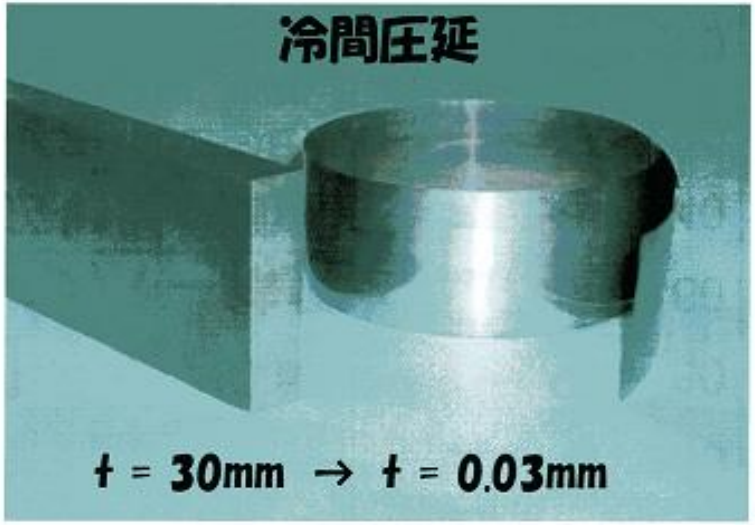




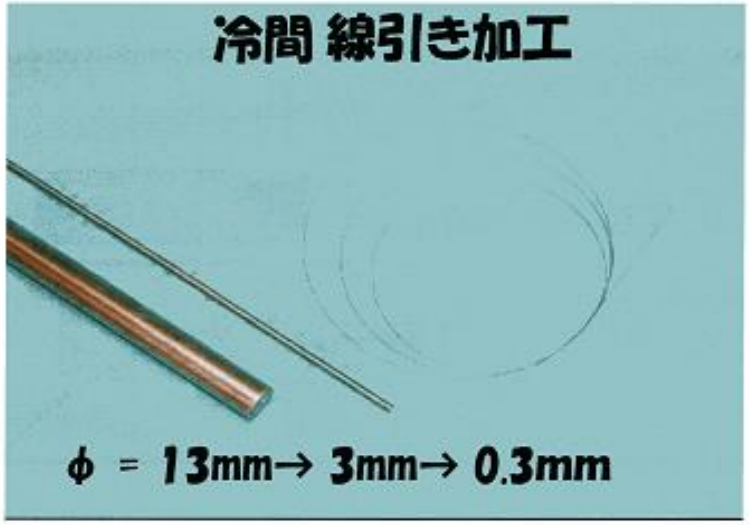
Unique characteristic of GUM METAL

【5】 Super-Plastic nature

(No work hardening⇒cold plastic working to 99.9% or more)



【 加工率： 99.9%】



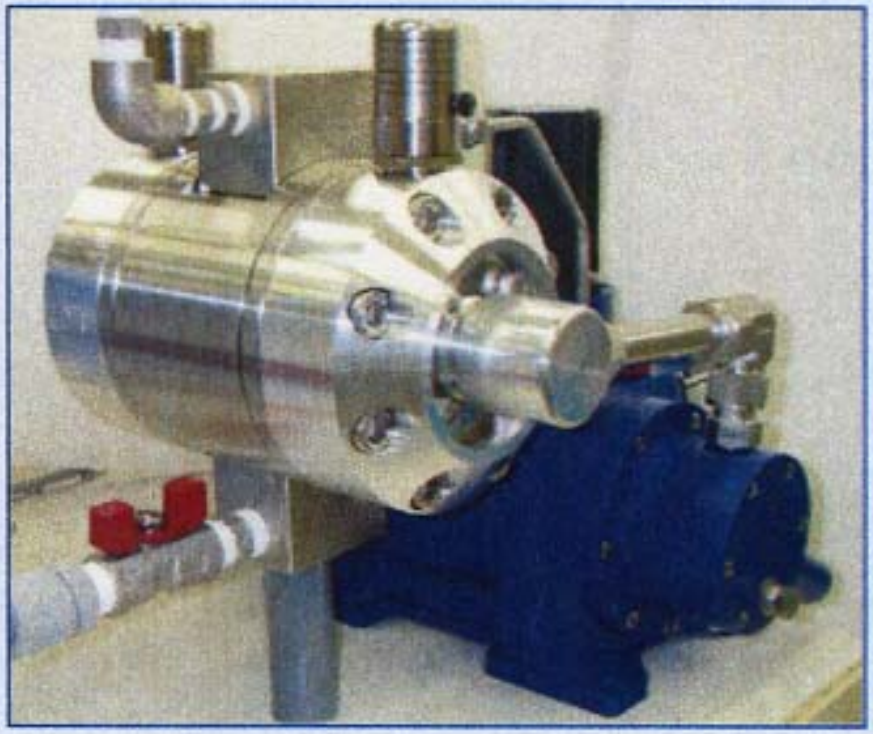
【加工率： 99.95%】

タクミナ殿へ技術導入（新規ダイヤフラム）

改善

- 材料特性の見直し
  （圧延方法検討：豊田中研）
- プレス方法
- ダイヤフラム形状

試作ポンプ



the world's first high-pressure pump

key factor for success of technology transfer

1.TOYOTA CRDL：expert opinions, belief, group sharing

・The sympathy for the attitude toward technology innovation in the transferred company made cooperative and supportive system

・A great support from researchers

・Held a lecture about technology transfer to every employee concerned (from manager to on site)

・・・3times

2. Toyotsu Material Corporation

・a strong ambition to development and achievement in making preproduction sample

3.TAKUMINA Corporation：ambition , responsibility , patience

・an ambition to new subjects including technology innovation（technology innovation ）

・trusting relationship to TOYOTA CRDL and keep good relationship

・person in charge keeps strong ambition, responsibility and patience

Benefit of TAKUMINA Corporation

1）Through this process corporate policies of Toyota group were transferred as well

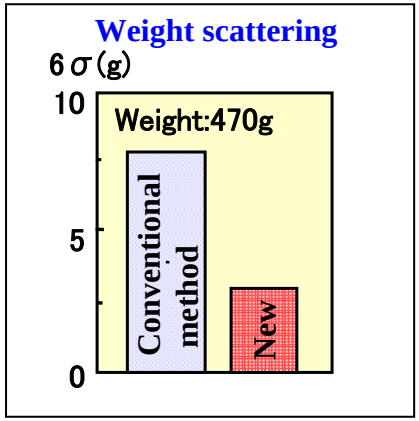
2）TOYOTA CRDL provided technical support for development and research

Aeration Powder Filling

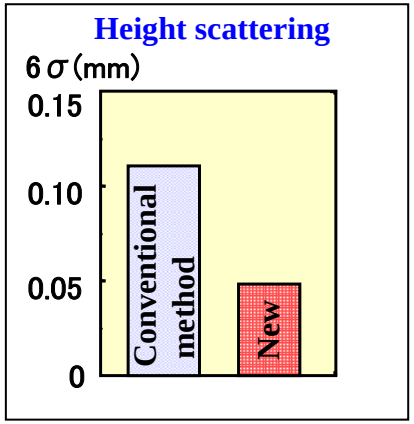
For compacting of metal powder for sintering with a die, the technology to fill the powder uniformly as well as quickly in the cavity of die was developed.

Characteristics

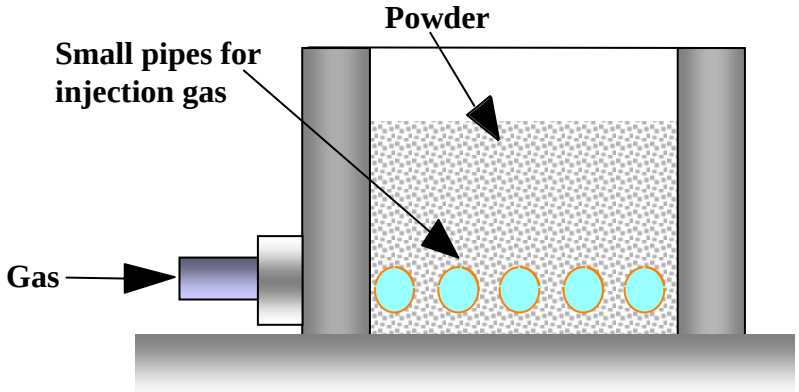
For large and complicated shape parts, uniform and fast powder filling is possible. As a result,the particle size segregation, density irregularity and weight scattering that take place at powder filling are markedly reduced and, at the same time,the productivity improves largely.An outstanding weight precision and height precision can beachieved by the method.



Improvement in-weight precision

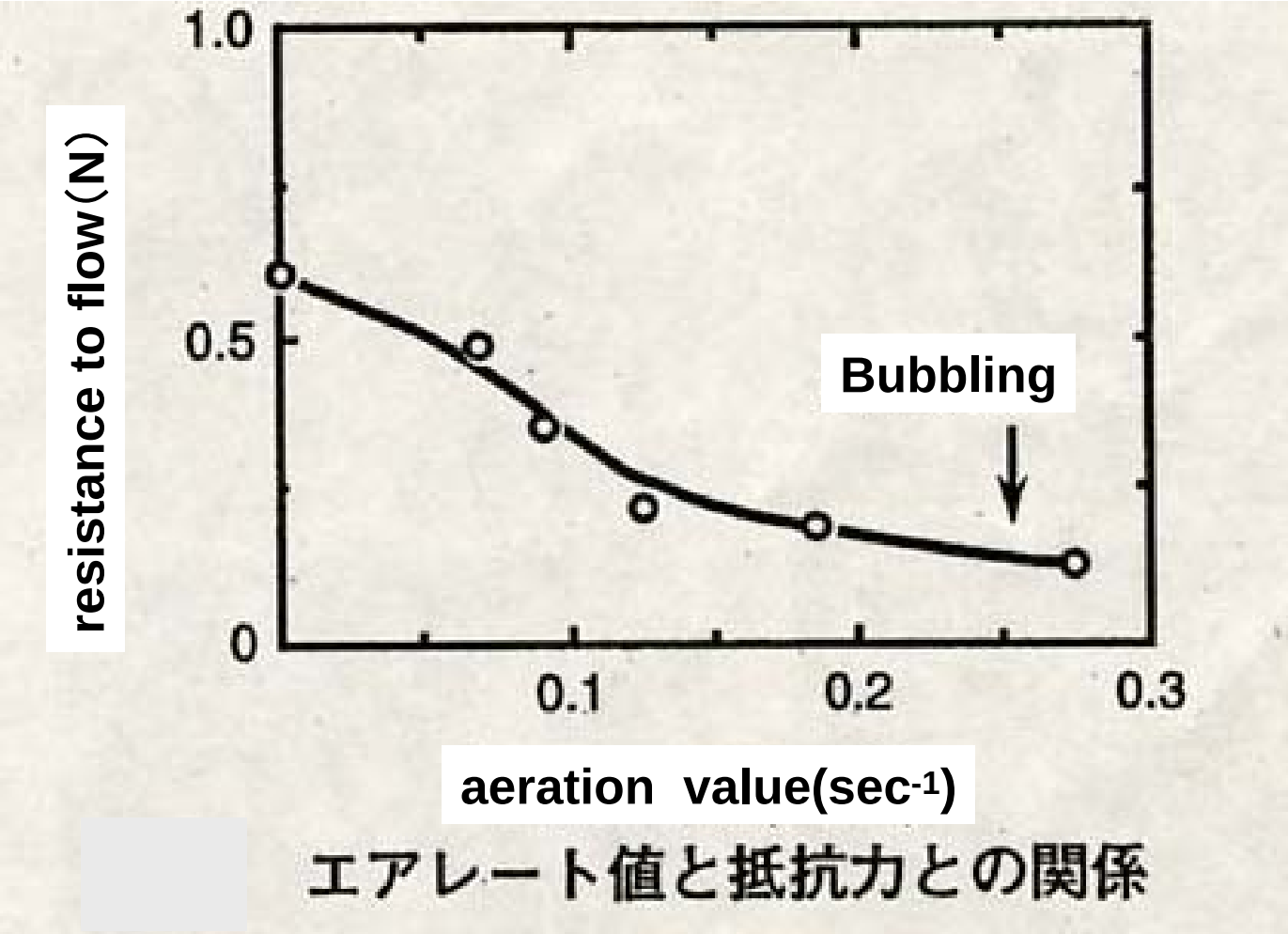


Improvement in-Height precision



Feed shoe for aeration powder filling

Flowability of powders



（aeration value＝gas flow Vg（cm3/sec）／powder volume Vp(cm3)）

What is the key for success of technological innovation ?

SHIBUYA KOGYO

・ambition to technological innovation in their present business
・improvement of productivity by introduction of new technology

・keen eye for technology
sintered part technology was transformed into cutter technology
・an expansion to joint invention

TOYOTA CRDL

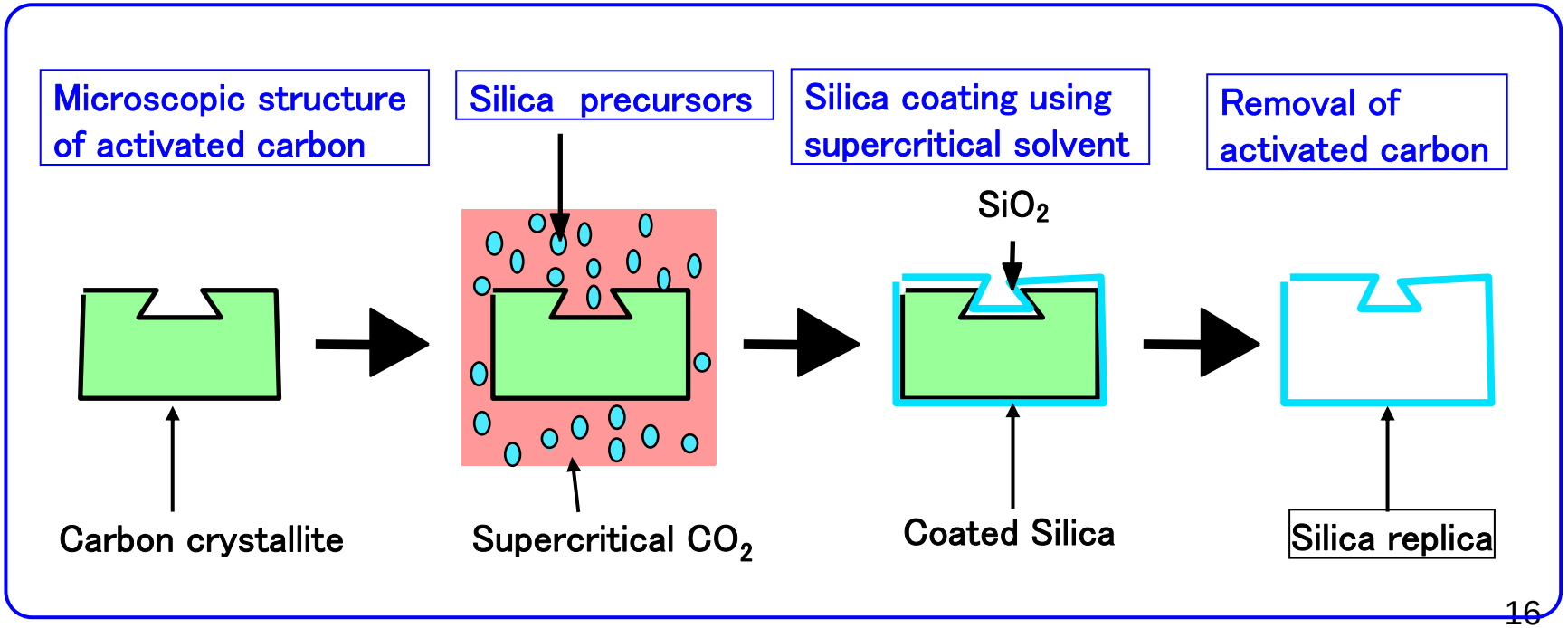
・success beyond our expectations⇒researcher's dream
creative idea beyond foreseen
(parts technology ⇒ cutter technology)
・cooperation between various industries
⇒hold a lecture for executives and field site
・be regular customer（under evaluation 2nd technology）

Nanoscale Casting using Supercritical Fluids

Demonstrated a novel method to synthesize porous materials using supercritical fluids, can be prodused nanoporous materials of silica,titania,alumina, etc.

Method

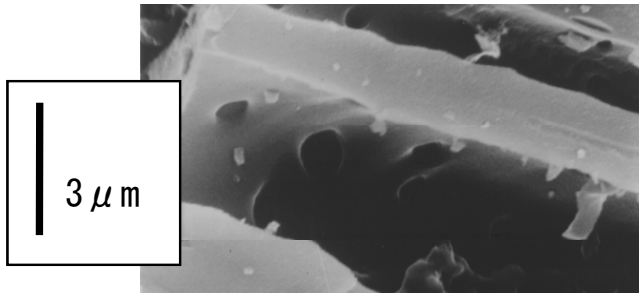
Formation of nanoporous replicas by the Nanoscale Casting process using supercritical fluids



Characteristics

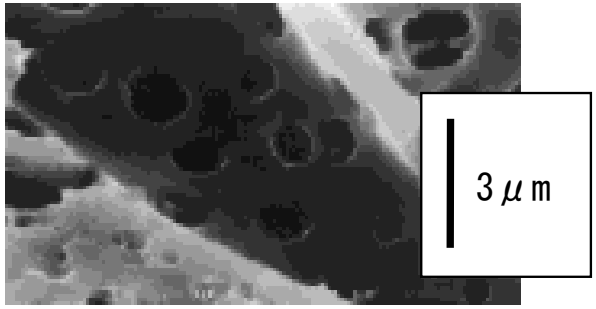
1. Nanoporous metals or metal oxides replicating the morphology over a wide range from nm to mm can be produced.

2. Huge specific surface area: 1300 m^2/g



Template:activated carbon from palm nutshell

Silica coating using supercritical fluid & calcination



Silica replica

隆祥産業殿へ技術契約(超臨界流体応用技術)

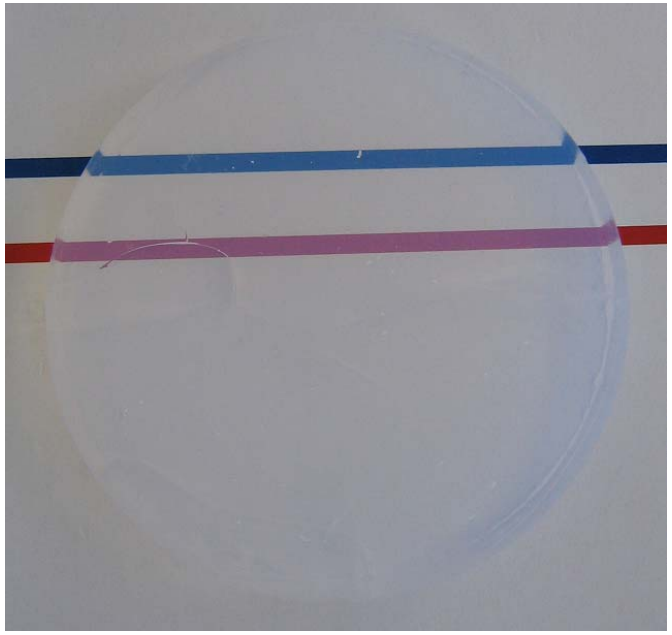
Silica-aerogel
can be produced

[図2]

Characteristics

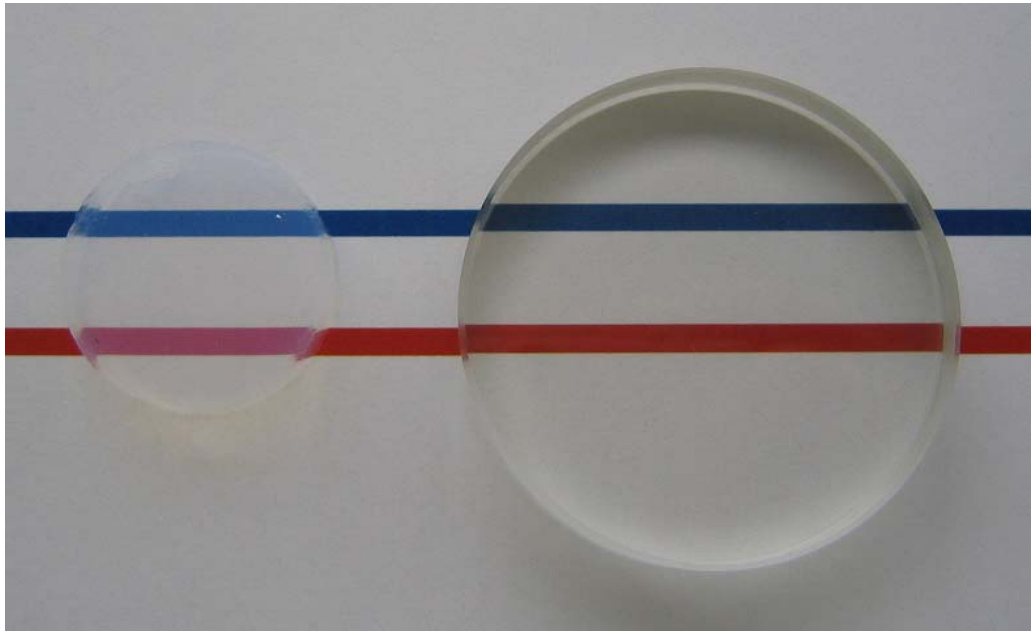
density：0.003～0.35g／cm3
cristallization size：nm order
surface area：600～1000m2／g
refractive：1.0～1.05
heat insulative number：0.001W/m・K

Silica aerogel



Aerogel

Quartz



Compare of light refractive index

What is the key for success of technological innovation ?

Executives of Ryusyo Industrial Co., Ltd.

・to expand their new products
・research in application field
・point aimed at invention of nano materials
・request technical guidance to TOYOTA CRDL
・to make an entry in automobile industry market

TOYOTA CRDL

・Unexpected development to various fields
⇒as a coordinator
result in invention of nano materials
(thinking from a different angle)
・cooperation between various industries
⇒held a lecture for executives and field site
・ be regular customer ⇒2nd technologic transfer

洗浄・乾燥装置(6、8インチ)

（超臨界CO_2装置）

Evaluation of Result

2/2003～2/2007

item	evaluation figure	Memo
entry	65 technologies	exclude software technology
Technology Fair	31 times （ for 4years ）	various industry-academia-government collaboration event
closed a deal	18 companies 20cases	practical 6cases、pre-production 11cases、development 3cases (5cases ／year)
closed a deal%	about 30%	20technologies／65 entries
practical application	6 technologies	30% of contract by deed
contract under consideration	23 cases （ 20 companies ）	Under testing 11 samples
total inquiries	43 cases （38 companies ）	total participating companies about 500 (1．4cases／times about 8%)

*practical application :just productization, not contribute to earnings yet

*take some time for practical and sales ⇒ honest 、long term

The Key of success for Technology Fair

・TOYOTA CRDL took control all process for Technology Fair
(plan, technology transfer, utilization…as below 1～5)
・TOYOTA CRDL obtained a great backup from executives of a company
(shared awareness regarding contribution to society of TOYOTA Group's technology)

1. pick a theme

・disclosure of know-how (research tool, analytical tool)
・select one feature technology at each fair ⇒ to avoid mannerism
・fit participant 's need ：mark the legislative change

2. produce posters

・objective criterion and standardize style
・clear and concise style 、key point、user satisfaction

3. explanation of technology

・effective proposal：be sensitive to customer's true needs
・more one introducing of technology（be stocked with wealth of information ）

4. negotiating a contract

・follow-up activities（Timing matters! ：not persistent and keep hot-line ）
・trusting relationship（visiting、interviewing、meeting⇒understand customer's point of view ）
・hold lecture meeting（introduce other technology ⇒ regular customer ）

5. technology transfer

・intercommunion（from executives to on site）⇒cooperativeness
・support activity（development, commercialization, marketing）
・consulting service（ ⇒ regular customer ）⇒service-mindedness

Significance of Technology Fair

1.Technology Fair made contributions to technology innovation and new-product development for Tokai Manufacturing Industry Creation, Kinki Manufacturing Industry Council、Hokuriku Manufacturing Industry Council and TOYOTA Group companies.

2.TOYOTA CRDL was lauded for advanced technology (automobile-related technology), and then succeeded in expansion to various field (food, medical, space, etc.) possible.

3. Technology Fair resurrected sleeping patent and brought a profit making effective use of intellectual property right and turning researcher's dream into reality.

what it takes to coordinate for technology transfer activity

1. <u>keen perception</u>（ experience 、inquiring mind 、romantic ）

・ keen eye ⇒a broad range of knowledge and all-round ability

・ field-oriented approach （educate the eye ）

2. <u>rich store of knowledge and experience in technology field</u>

・quick reaction capability（win the trust of customer）

・active participation in technology fair and seminar of other field

・holding of lecture about new and advanced technologies

3. <u>have varied networking of a wide range of fields</u>

・active

・gentle

・business analytic skills ⇒ ability of new business proposal

4. <u>gather market needs</u>

・<u>information networks</u>（power of networking ）

・recognition and analysis of needs for customers

Requirement for success of technology transfer

note	Transmitter	Coordinator	Recipient
High quality technology	Make a debut	Belief	Ambitions Decision
Keen eye	Novelty Utility	Possibility Potential	Differentiation Profit
Development	——	Visibility	Improvement Fusion
Cooperativeness	Basic knowledge	keep harmony	Sense of unity
Knowledge of outside one's field	Deployment	Wide knowledge Versatility	——

Assignment and Development view

subject	effort	development
expedite practical application	further follow-up	frequent visit
	provide speedy information (e.g. sample data)	provide new information
further business inquiry	well-selected theme suitable for Fair	–
	make a chance to get technology information	small scale Technology Fair
	expanding opportunities	Shikoku, Kyushu, Tohoku areas

contribution to sales	transferred company bring new and wide market	build up new clientele

key factor for success

- @ forgive for others mistake
- @ don't blame others
- @ always smiling
- @ cheer up others spirits
- @ challenge to get rid of trouble
- @ get over difficulties
- @ stay there without escaping from difficulty
- @ don't try to look good
- @ listen to others talk
- @ hang in here and show the spirit
- @ try to be my own critic
- @ share a problem with the other person and understand each other
- @ always show my best

Keep the challenge ! If you try, you can make it !

≪Dūnhuáng ≫walking in Echoing Sand Mountain