"Worldwide Leaders Meeting on Global/Local Innovations for Next Generation Automobiles" on November 28, 2013

Regional Innovation Cluster Policy of MEXT

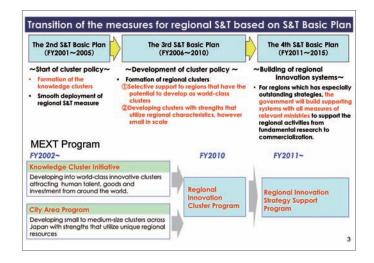
Hiroki Takaya

Director for Regional R&D Promotion, University-Industry Collaboration and Regional R&D Division, Ministry of Education, Culture, Sports, Science and Technology (MEXT)



- Background of regional science, technology and innovation in Japan
- Regional Innovation Strategy Support Program (RSSP)
- 3. Future direction of regional science, technology and innovation in Japan
- 4. Activities toward globalization of regional clusters

Quick overview of the history of Science and Technology Basic Plans The 2nd S&T Basic Plan (FY2001~2005) The 3rd S&T Basic Plan (FY2006~2010) The 4th S&T Basic Plan The 1st S&T Basic Plan (FY1996~2000) Three basic ideas Basic Concept om wisdom ated society by oc priority setting in \$8. Ition of basic nes Key policies Realization of Sustainable Growth and Societal Development into the Future Recovery and rehabilitation from the recent earthquake
Green and life Innovation
Enhancing Basic Research and Human Resource Development
System reform for Innovation ization of R&D on al/social subjects Construction of new R&D •Total budget of 2nd basic n of industry-Total amount of the →25 trillion YEN government R&D investment Total budget of 3rd basic (MEXT) based on materials prepared by the Cabinet Office 2



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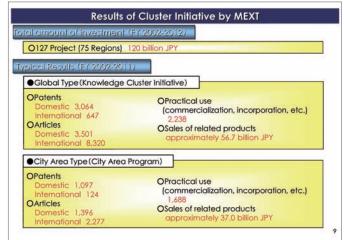
| "Regional Innovation Strategy Promoting Regions" with excellent visions toward the creation of regional innovations as → Jointly designated by MEXT, the Ministry of Economy, Trade and Industry (METI) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) Among these regions, those with especially outstanding strategies will receive seamless support from these ministries to help the regions realize their innovation strategies comprehensively and efficiently.

| Innovation Promotion | Council | Innovation Promotion | Innovation Promotio







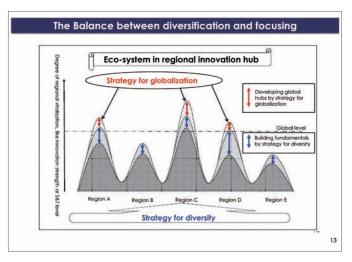


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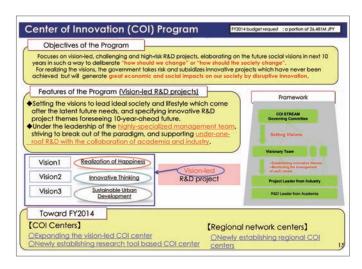
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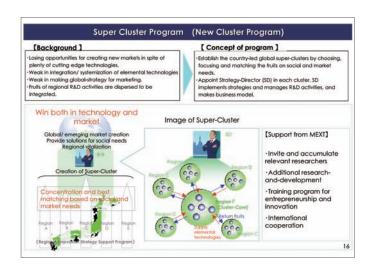






More expansion/development of regional diversity
 Making a best use of regional resources for national problemsolving
 Strategical goal setting, acquiring global markets and standards
 Matching between seeds/needs for radical innovation
 Sharing experience among deferent fields/countries
 Pursuing win-win relationship



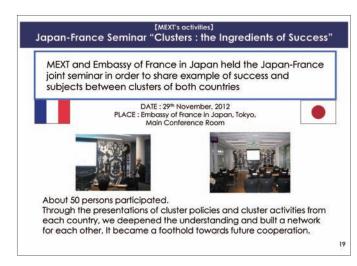


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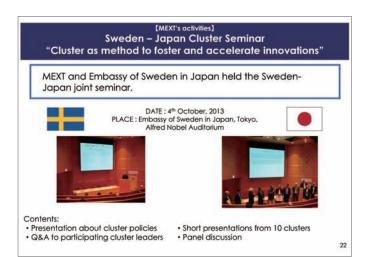
Advanced Regional Innovation Policy

Cluster Network for synergy
-domestic
-foreign (sister cluster)













VisLab's latest Autonomous Driving challenges: from intercontinental to urban tests

Alberto Broggi PhD

VisLab, The Artificial Vision and Intelligent Systems Lab.

Dip. di Ingegneria dell'Informazione, Universita` di Parma Parco Area delle Scienze 181/a, Bldg 1, I-43124 PARMA, Italy E-Mail: broggi@vislab.it - www.vislab.it

Abstract

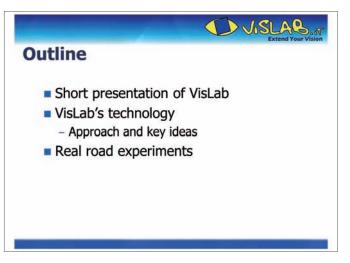
VisLab has been active in the field of intelligent vehicles for the last two decades: after the first test (2000+ km in semi-autonomous mode in 1998), VisLab designed and realized the perception system of TerraMax, the largest entry in the DARPA Challenges, which was the only vehicle that reached the end of the DARPA Grand Challenge with vision as primary sensor. In 2010 VisLab conceived and realized the longest ever test for autonomous driving: 13,000 km from Italy to China. On July 12, 2013, VisLab tested urban driving in a real environment for the first time ever with nobody behind the steering wheel: BRAiVE, VisLab's most advanced intelligent vehicle, drove in downtown Parma, negotiating two-way narrow rural roads, pedestrian crossings, traffic lights, artificial bumps, pedestrian areas, and tight roundabouts.

The presentation discusses current trends and the evolution of ADAS (Advanced Driving Assistance Systems) and also presents VisLab's vision on environmental sensing for intelligent vehicles.

Alberto Broggi

Prof. Alberto Broggi received the Dr. Ing. (Master) degree in Electronic Engineering and the Ph.D. degree in Information Technology both from the Universita` di Parma, Italy. He is now Full Professor at the Universita` di Parma and the President of VisLab, the Artificial Vision and Intelligent Systems Laboratory. As a pioneer in the use of machine vision for automotive applications and on driverless cars, he authored of more than 150 publications on international scientific journals, book chapters, refereed conference proceedings. He served as Editor-in-Chief of the IEEE Transactions on Intelligent Transportation Systems, 2004-2008; he served the IEEE Intelligent Transportation Systems Society as President for the term 2010-2011. He is recipient of two ERC (European Research Council) prestigious grants.











- Single or multiple vision sensors (Monocular, Stereo, Motion Stereo, Tetravision, data fusion)
- Data fusion (laser, radar, vehicle data)
- Real Time, multithreaded software environment

JISLAR **VisLab Peculiarities** Long experience on the field with: - Real prototypes: cars, trucks, off-road, mining, road construction, maritime, military - Different companies and governmental institutions worldwide







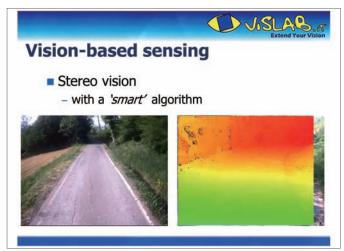






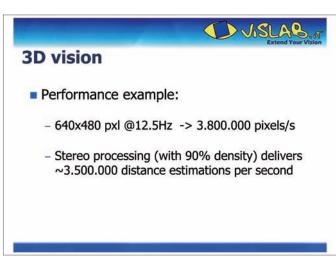






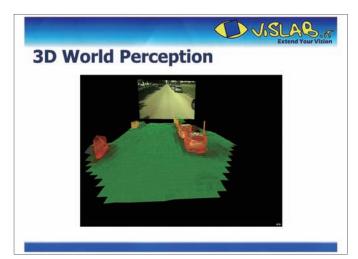










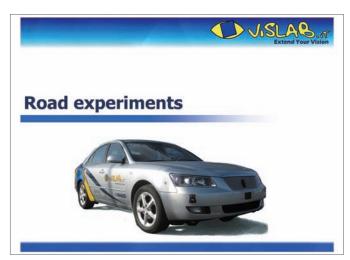














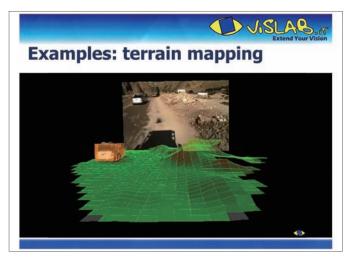


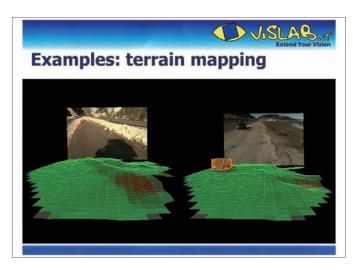












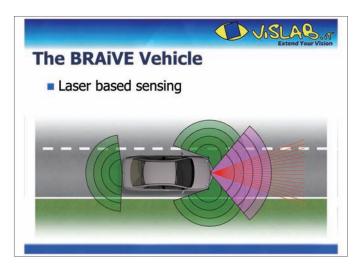


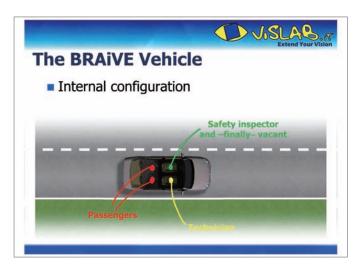




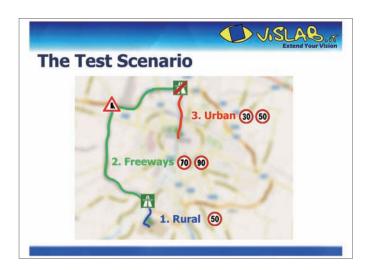




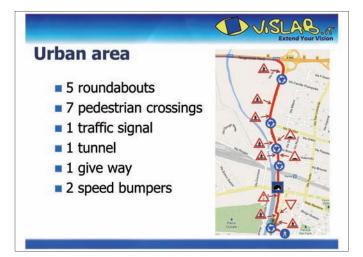










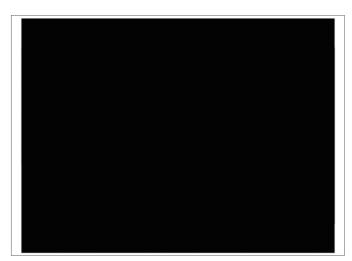












Results

- About 13 km (3km in urban area)
- Driven in about 18 minutes (at 11am on a working day)

JUSLAS.

- No human interventions
- Is autonomous driving solved?



VisLab's latest Autonomous Driving challenges: from intercontinental to urban tests Alberto Broggi VisLab - University of Parma, Italy broggi@vislab.it

Tohoku Univ, Sendai, JP – Nov 28, 2013

Katsuto Nakatsuka

Project Director

Next Generation Automobiles / Miyagi Area

Next—Generation Automobiles / Miyagi Area Katsuto Nakatsuka, Project Director

My idea for bring regional innovations in Miyagi Area

OMake the knowledge networks of researchers and social needs networks of enterprises, then share the use of new facilities and equipment among members.

-basic structure-

1. Find the exact needs concerning to the usage of automobile in the targeted region, and design their specification. If suitable type of automobile is not found, regional enterprises prepare it themselves.

2. Examination of LNG-DDF engine is being conducted by the collaboration of three regional companies(Poster No.67). The technologies of the enterprise leader are high-and-wide, and their time schedule of experiments is unexpectedly short. In my opinion, the collaboration of enterprises has possibilities to link to high-speed technology development, different from large-scale cooperation system in big companies.

Example 1. New transport system around a metro- station. Prof. Hasegawa will describe an example.

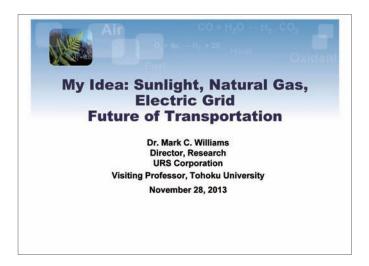
Example 2. Reconstruction of agriculture and fisheries industry in a sea side area invaded by Tsunami, is hopefully designed to separate the working and residence zones.

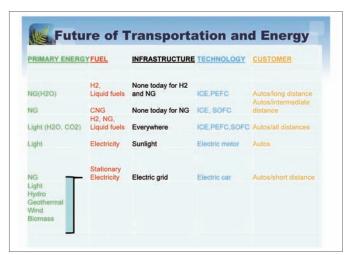
A new transportation system for going and coming of workers is essential there. The specifications of automobile and system management under the given economic conditions should be carefully examined. This kind of discussion is going on.

Mark C. Williams

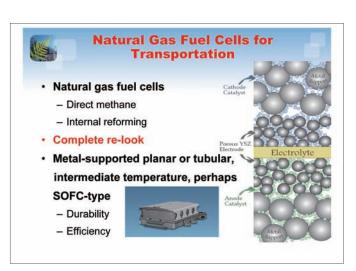
Director, Research

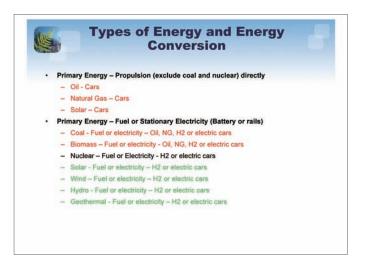
URS Corporation

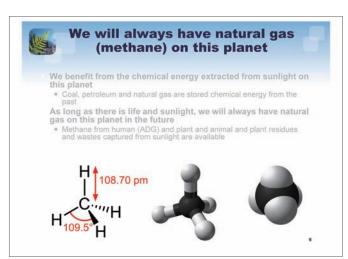


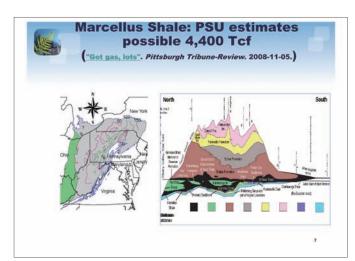




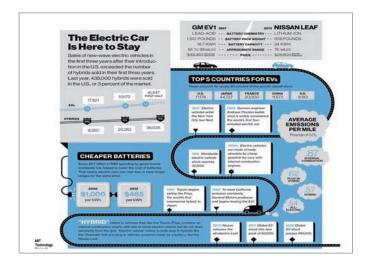


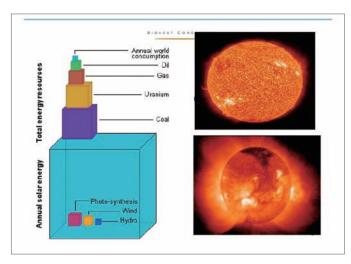














Solar Vehicles

- With the SEV solar system, the Toyota Prius can operate up to 30 miles per day in electric mode thus improving fuel economy by up to 34-60%.
- Power density: Power from a solar array is limited by the size of the vehicle and area that can be exposed to sunlight.



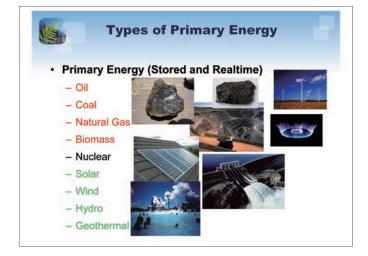
- » While energy can be accumulated in batteries to lower peak demand on the array and provide operation in sunless conditions, the battery adds weight and cost to the vehicle. The power limit can be mitigated by use of conventional electric cars supplied by solar (or other) power, recharging from the electrical grid.
- » triple hybrid vehicle—the PHEV that has solar panels as well to assist
- Cost: While sunlight is free, the creation of PV cells to capture that sunlight is expensive. Costs for solar panels are declining.





The Questions

- How do we prepare for the Future of Transportation and Energy proposed?
- How long is the transition period from current policy of using stored energy to direct solar and renewable? 50 years? 150 years?
- · What to we do in the transition period? R&D where?
- How do we transition population, energy resources and environment peacefully during the limited transition time available?
- · What should the World Energy Policy be?
- · I have said nothing about the environment



Yasutaka Iguchi

Chairman

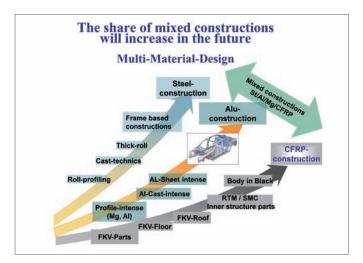
Board at Miyagi Organization for Industry Promotion



Target of Development of the Car

High Fuel Efficiency, High Mileage
Light Weight→Aluminum ,Magnesium,Titanium
Carbon fiber reinforced plastics
Safety to Collision

Super High tensile Strength Steel
Catalyst for Exhaust Gas
Workability of Corrosion Resistant Steel
and Special Steel

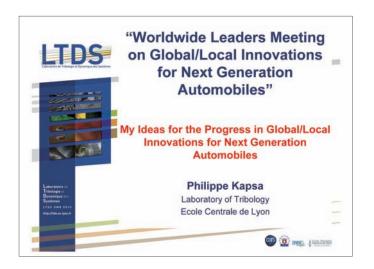


Fuel Cell Car: Ultimate Candidate of Next Generation Automobile Development of Conversion of Hydrocarbon to Hydrogen Catalyst and Removal of Carbon Dioxide Materials for Hydrogen Cylinder Lithium Ion Battery High Efficient Motor Permanent Magnet Silicon-Steel (Electro-magnetic Steel) Price, Mass Production

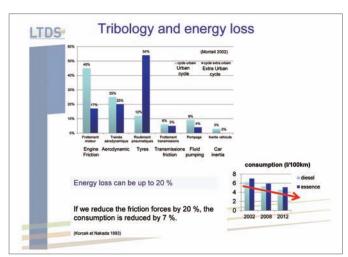
Philippe Kapsa

Senior, Researcher, CNRS

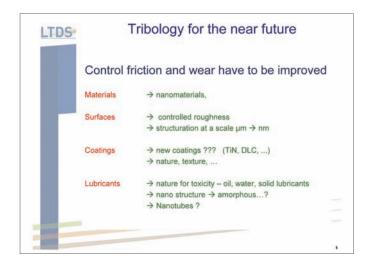
Laboratoire de Tribologie et Dynamique des Systèmes UMR CNRS 5513 Ecole Centrale de Lyon













<u>Tokuta Inoue</u> Senior Research Fellow

Tohoku University

Lessons from the history of Toyota

Tokuta Inoue Senior Research Fellow, Tohoku University (Toyota Genesis Research Institute)

Innovation for next generation automobile

- Product innovation
- Production method innovation
- Business model innovation



KIICHIRO Automatic Loom

- When I was busy making a design, I heard a "Hmm" right by my ear. "That's an interesting looking design. You like this sort of thing. So, if you want to do research on the automatic loom, you can". At last I was given permission by my father to do research openly"
- "One stage shuttle changer" was invented which was superior to Sakichi's old idea of "Two stage shuttle changer"
- This new idea was patented (Pat. No. 65156) and transferred to Platt Brother's & Co

KIICHIRO-Toyoda-Platt Agreement

- · Second trip to west
- Doubt about the future of the Automatic Loom Business
- The Toyoda Platt Agreement
- · Appraisal of TOYODA Type G Loom
- · Decline in Platt Brother's assembly technology





KIICHIRO-"Just-in-Time"

 "Making sure you don't have too many or too few. In other words, making sure one doesn't use too much effort and time for producing a specific item. No waste and no surplus. When a part moves down the assembly line, you have to make sure you don't keep it waiting. I think it's important that every part be ready just in time. I believe this is the first principle in improving efficiency"

KIICHIRO-His courage, challenge and creation

- Kiichiro took greatest pride in being textile machine engineer.
- · But he was more than that.
- As soon as he had doubts about the future of the textile machine business, he showed a courage in making a shift to the completely unknown business of making automobile as a founder of TOYOTA motor corporation based on the "Five Main Principles of TOYOTA"
- He was an innovative person who, not intoxicated by his initial success, did not shrink from the enormous task of pioneering major change



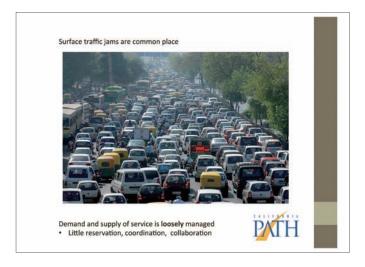
Roberto Horowitz and Thomas West

Directors

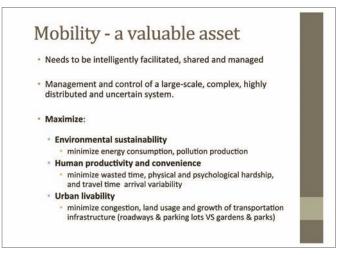
Partners for Advanced Transportation Technology
University of California, Berkeley





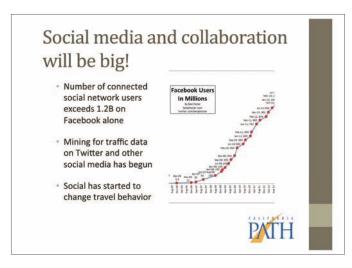


Mobility - a valuable asset Needs to be intelligently facilitated, shared and managed Consumes precious resources Energy Human productivity (time, effort, stress, etc.) Land and infrastructure resources Produces undesirable byproducts Pollution (CO2, smog, noise) Congestion, poor urban livability



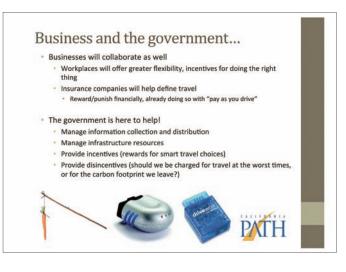










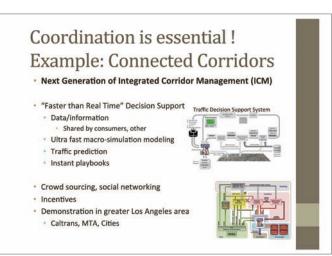












Coordination is essential!

Extend coordination and collaboration from traffic management to mobility management

- Utilize vehicle to vehicle (V2V) and vehicle to infrastructure (V2I) communication.
- Utilize social networking and real-time sharing and collaboration tools.
- Enhance performance and convenience of automated and autonomous vehicles.
- Enhance real-time response of rail and transit services, taxis and commuting and car sharing services.
- Enhance real-time information dissemination and coordination of mobility choices.

Solving Coordination and Collaboration Challenges

- Can mobility demands and conditions be accurately forecasted?
- · Centralized VS distributed decision making?
- · Will decentralized collaboration lead to instability?
- How can we best manage mobility information dissemination and resources allocation?
- How can we effectively manage a large-scale, decentralized an uncertain system?





Thank You

Roberto Horowitz and Thomas West
Directors
California PATH
University of California, Berkeley
horowitz@berkeley.edu
tomwest@path.berkeley.edu



Hideomi Koinuma

Visiting Professor

Tokyo University

Proposal of Multi-brid car @Sendai conf. on future automobiles 20131127 H. Koinuma, Tokyo University, Tsukuba University, Comet Inc. Ltd.,

-Can the car keep a main player in future society, judging from life (health), energy, environment and business?

O Basic concept

- * What is a transporter superior to Hybrid, EV, and PHV cars?
- · How can we save money and time to compensate weight gain and
- muscle loss caused by constantly relying on car?
 •Assist warming up from inside the body instead of energy consuming electric heater to overcome a serious weak point of EV in cold areas
- *Heat is a lower grade energy, since it inevitably accompanys loss in conversion.

→ Multi-brid car assisted with man power

O Design concept of car innovation

- *Renewable energy
- Implementation of health care units with sensing devices and athletic functions that can work also at emergency
- ·Drive with hands only and let feet free for physical training: Add athletic room function to driving car.

Multi-brid car (MBC)

** *New concept car equipped with health care and athletic gym function.***

Why? EV has a serious weak point for deployment in cold local areas, if the air-conditioning, especially heating, is driven by the battery.

What is MBC? Man power is not so big (100~600 W), but it can help not only battery charging but also warm up his body from inside.

How, who, where, and when? Install bicycle-type electric power generator at driver's and passengers' seats. People can work and relax as they like under monitoring their health care sensors.

Thus, automobile can be an athletic room, in addition to transportation tool.





Fig. 1 Bicycle type human power electric generator: 200-600 W

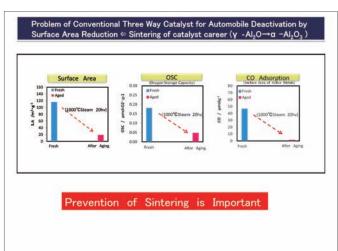
Prof. Hatta @ Kochi Inst. Tech

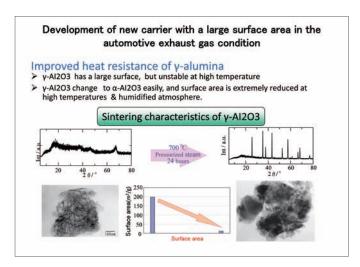
Osamu Okada

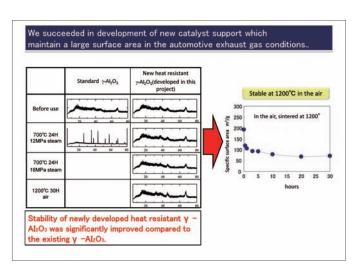
President

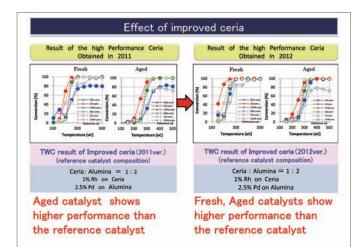
Renaissance Energy Research Corporation

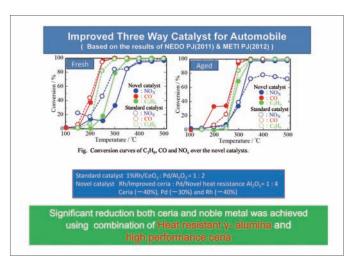


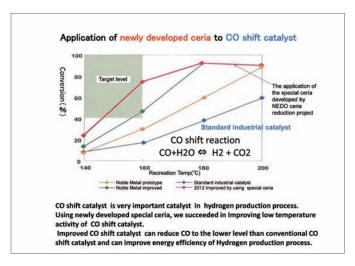


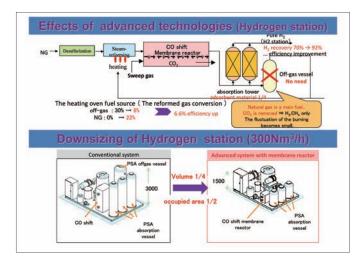


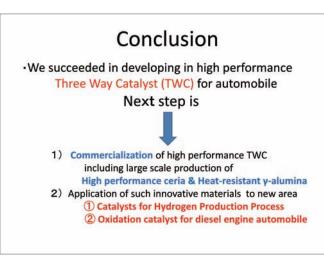


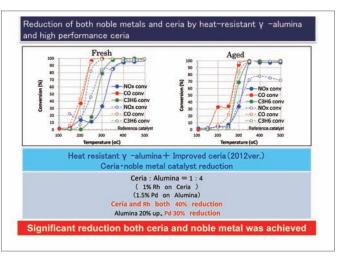












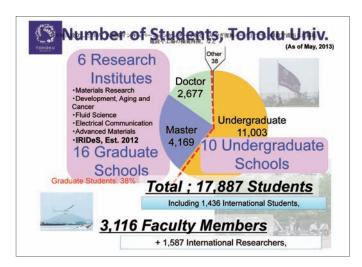
Next-Generation Advanced Mobility System

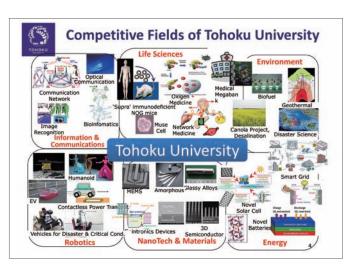
-Promotional activities supporting local industries-

Prof. Fumihiko Hasegawa Deputy Director, New Industry Creation Hatchery Center, Tohoku University

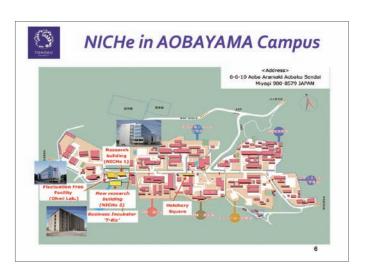








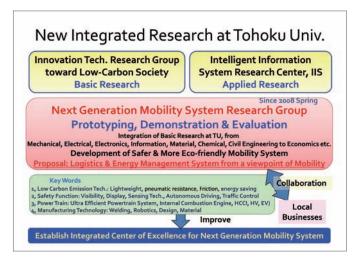




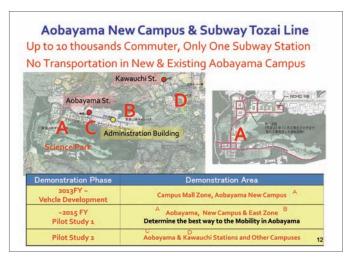








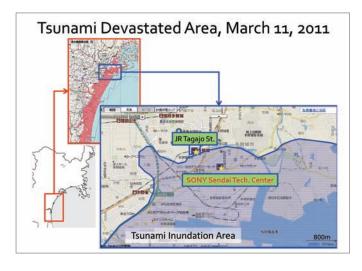




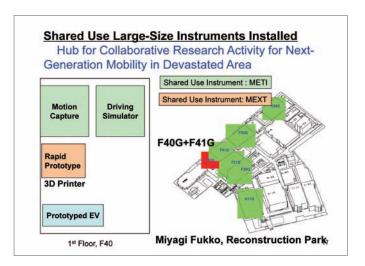


Contribution to Local Community

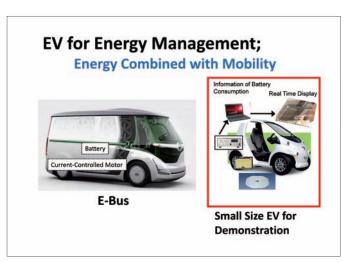
- 1, Miyagi Fukko, Reconstraction Park
- 2, Traffic Control, Safety, User-friendly
- 3, Evacuation at the time of disaster or Emergencies
- 4, Energy Supply in the Event of Electric Outage

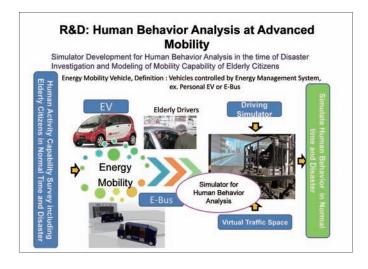


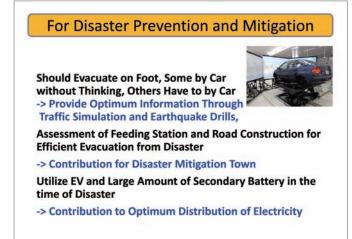


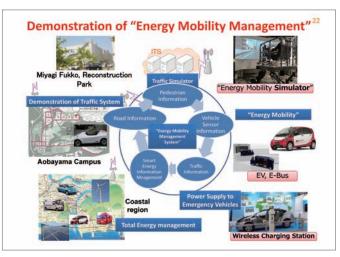








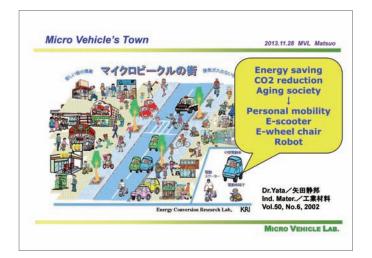




Hiroshi Matsuo

President

Micro Vehicle Lab. Ltd.





Thomas Behling

Executive Director

CENTRA Technology, Inc.

Next Generation Vehicle Control Concepts

How to Determine Which is Best: Autonomous, Autonomous with V2V Cooperation, or I2V Remotely Piloted Vehicles

1/31/2014

Remotely Piloted Operations Are Practical Where Traffic is Light



But Requires Expensive Human Control



Autonomous Vehicle Control with Cooperation is a Good Alternative Unmanned Military Platooning Vehicles Cooperative Adaptive Cruise Adaptive Cruise Degree of Assis Control Autonomy Intersection Speed Adaptation Movement Assist Cooperative Collision Warning Warning Lights and Systems Degree of V2V Cooperation Based Upon "Self Driving Cars: the Next Revolution" by KPMG LLP and the Center for Automotive Research (CAR), 2013

But Autonomous Control Systems Must Deal with the Unexpected

- · Control must be robust for individual vehicle and for cooperating vehicles
- · Single Vehicle example: if a ball were to roll into the path of a vehicle, a driver would expect that a child could follow. Car based sensors and algorithms need to anticipate such events
- · Multiple Vehicles (V2V) scenario: sensor failure during vehicle cooperation scenario could lead to "who do you trust?" issue

A Simple Example of Multiple Vehicle V2V: Cars "A" and "B" Approach Intersection · You are in Car A What is the protocol? Car B Car B has Car B systems OK system fault **Status** Standard traffic Standard traffic **Driver** in rules with alert Car **Driverless traffic Special Driverless** rules conditions

How to Determine Best Concept

Start with customer/driver needs; examples:

- Reduce time that driver is engaged in commuting (car acts like a train, giving driver time for other tasks)
- Add new time-saving functionality: operate car autonomously to pick up and deliver passengers (a robot chauffeur)
- Driverless city to city transport that provides a low stress alternative to airplane/trains, freeing time for other tasks

Issues to be Worked

- · What is the best form of vehicle control for these goals?
- How can effectiveness of control concepts be measured?
- What are the first steps that should be taken to answer these questions?

Some First Steps

- Assess utility of existing traffic models for their applicability to key driver needs discussed above, e.g., do the models work only for freeway traffic—can they handle dense urban traffic with pedestrians? Inventory data sets that are available for freeway or dense urban traffic and assess their utility for addressing driver needs

 Break down three exemplar needs discussed above into journey segments that could be modeled.

- be modeled.

 Identify gaps in models and data for simulating journey segments
 Prepare work plan for data gathering and for model development to assess journey
 segments. For example, existing data sets could be enhanced with observed data of
 traffic in city neighborhoods.

 Prioritize journey segments for simulation analysis
 Use data and models to identify and assess various traffic scenarios for key journey
 segments, (e.g., urban traffic at intersections with traffic lights and heavy rain).
 For the scenarios, examine driver/driverless interactions or pedestrian/driverless
 interactions and relative effectiveness of vehicle control systems (autonomous or
 autonomous with some V2V or I2V coordination).

 Catalogue and create taxonomy for unique classes of vehicle interactions

- Catalogue and create taxonomy for unique classes of vehicle interactions Develop test scenarios for validating vehicle interactions, V2V and I2V communication needs, safety, reliability, resilience under adverse conditi

Masato Hisatake

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CAMBRIDGE MODEL
BOTTOM-UP, LARGELY UNPLANNED

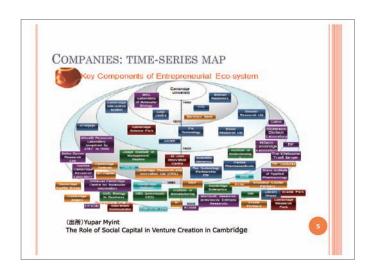
"Constructive chaos —there is no one group that 'organizes' Cambridge. New initiatives are continuously springing up —some succeed and some fail.

This may be perceived as inefficient, but does result in a highly entrepreneurial environment." (Cambridge TechnopoleReport (2008), p5)

To realize an innovative culture is also another innovation. (designed and/or evolved)

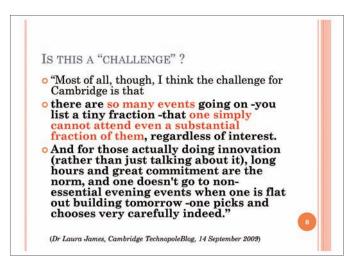
Various initiatives are awaited, including further empirical study.

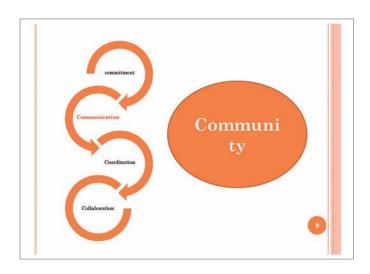












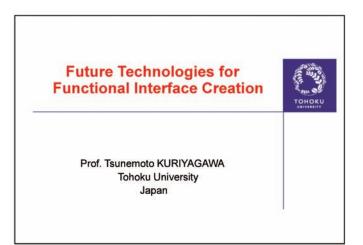


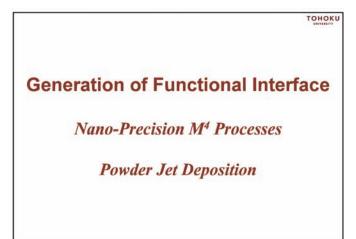
Tsunemoto Kuriyagawa

Professor

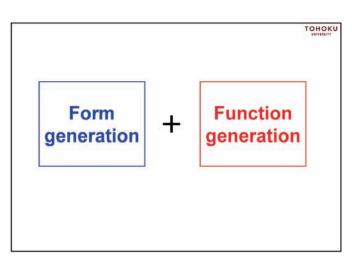
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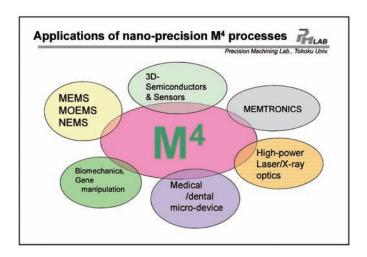
Tohoku University



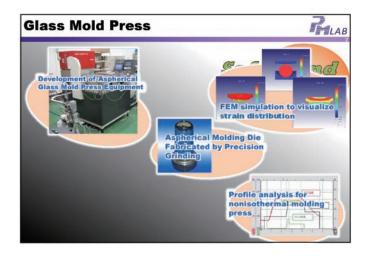


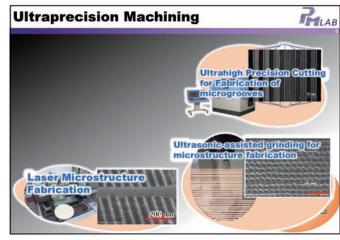


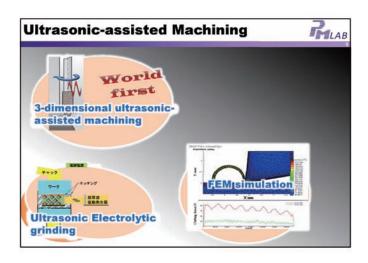


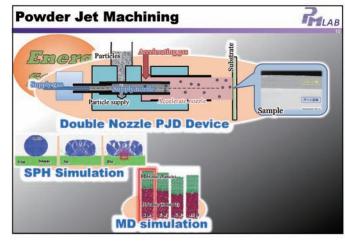




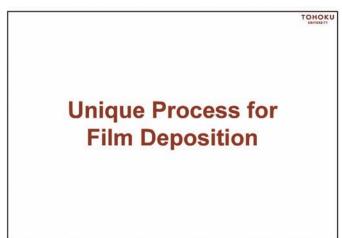


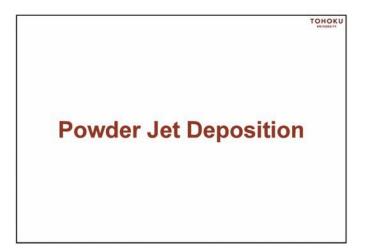


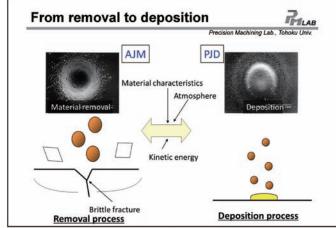


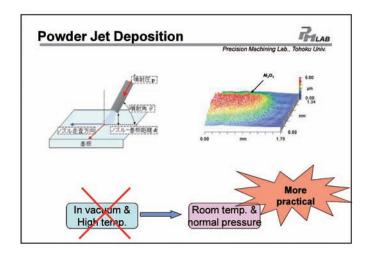


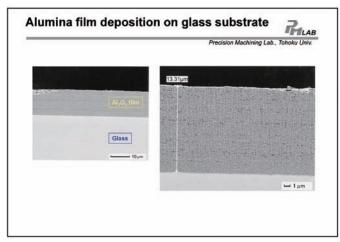


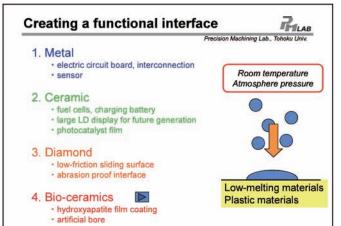


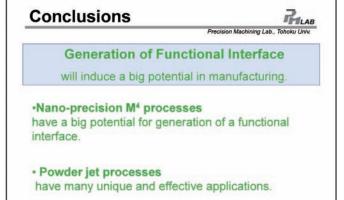














Kazuhiro Kosuge

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My Ideas for Developing Innovative Next Generation Automobiles

Kazuhiro Kosuge
Department of Bioengineering and Robotics
Graduate School of Engineering
Tohoku University

Outline



- · Start with something different
- Innovative ideas through Systems Integration
- Environment

Partner Ballroom Dance Robot



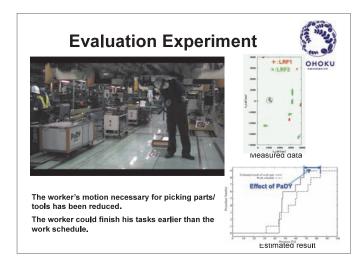


Automobile Assembly Line





- If a robot could provide the worker with necessary parts and tools when he/she needs them, the worker could concentrate on the assembly tasks.
- What the worker has to do is to assemble delivered parts using delivered tools to accomplish the work.

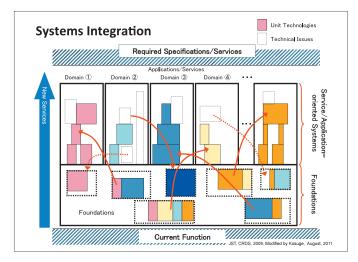




Outline



- · Start with something different
- Innovative ideas through Systems Integration
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Outline



- · Start with something different
- Innovative ideas through Systems Integration
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Why the Internet could Have Evolved so much and Created Innovations?



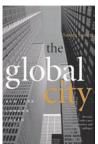
 The internet could have evolved so far because the internet allows hackers to do something different.



Why the Global City has its Prosperity?



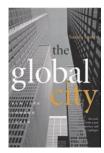
 Global cities have some space in which different people could come into and could do something different.



For the Development of Innovative Next Generation Automobiles



- We need a legal environment, which encourages/allows us to do experiments for the next generation automobile.
- Innovation could happen in an environment which has a similar structure as the global city.
- Without the environment, which allows us to do something innovative, we could not have innovative activities.



Conclusions

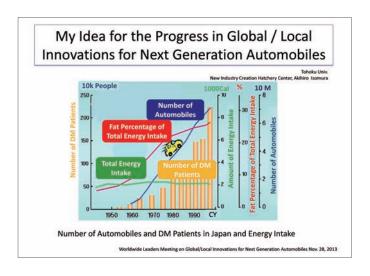


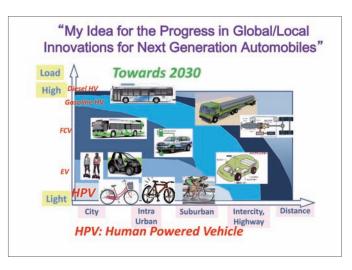
- · Start with something different
- Innovative ideas through Systems Integration
- Legal environment

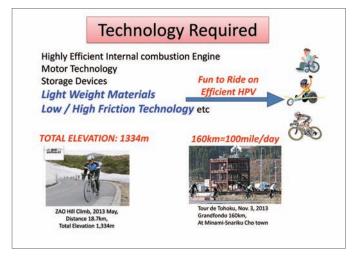
and a Passion

Akihiro Isomura

Specially-appointed professor New Industry Creation Hatchery Center Tohoku University







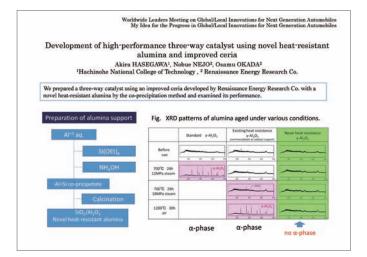


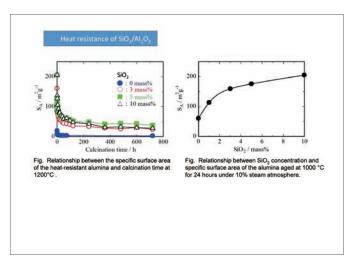
Akira Hasegawa

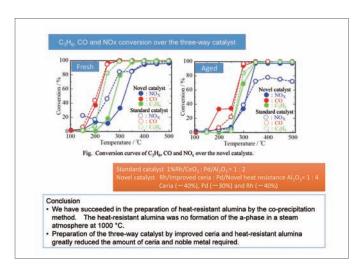
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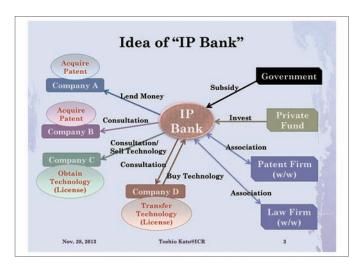
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Regional Cooperation Coordinator

Next Generation Automobiles / Miyagi Area



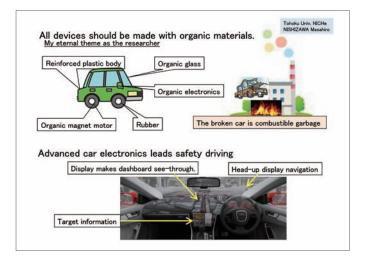


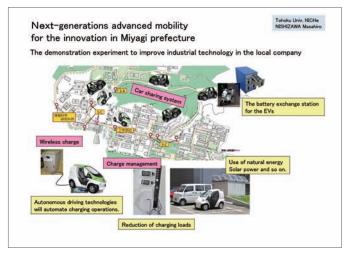




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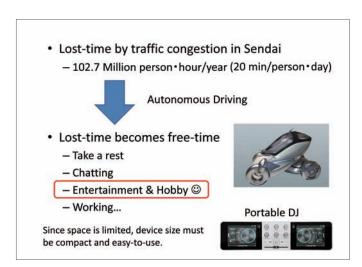
Naoto Miyamoto

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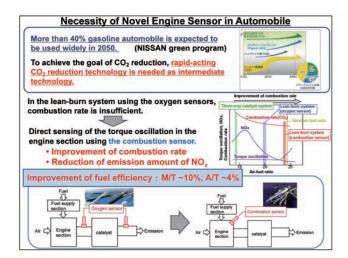
Our Product Features and Goal

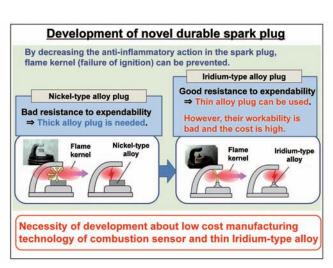
- · Real-time BPM analysis
- Various effects
 - Promotion videos and demo movies are available at http://www.monsterproducts.com/godj/
- · Digital cross-fader
- · Autonomous DJ playback
- We hope we create a novel audio entertainment equipment for the next generation autonomous vehicles.

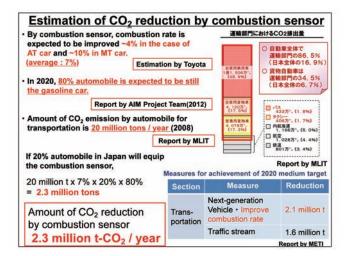
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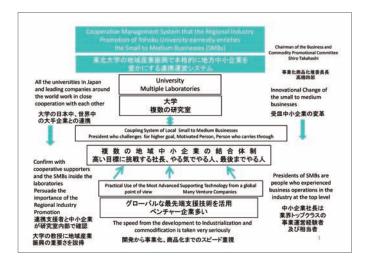


Shiro Takahashi

Chairman

Business and Commodity Promotional Committee

Next Generation Automobiles / Miyagi Area



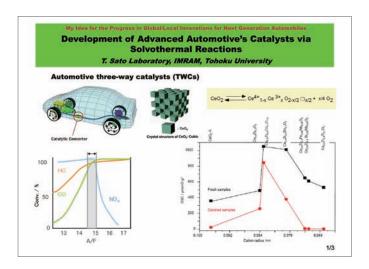


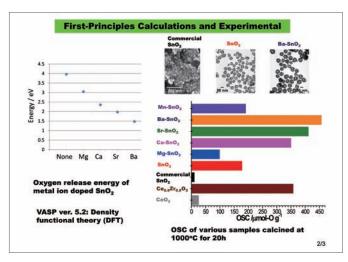


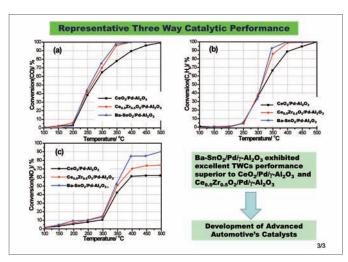
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