Nano High Throughput Technology

COMET

COMET Inc.

**Startup company from NIMS,
    the leading Institute of Materials Science**

High throughput screening business for new materials discovery and their applications

**CEO: Dr.Kenichiro Takahashi
Research Engineer : Dr.Toyohiro Chikyow**

Present business of COMET Inc.

- **New materials discovery service by high throughput experimentations**
  examples: thermoelectric, ferroelectric battery catalysis etc.

- **Sales of combinatorial sputtering system
  (6 guns are set in the deposition chamber)**

- **Supply of GaN on Si wafer for LED
  and power devices**

About the COMET Inc

Nano High Throughput Technology
COMET

COMET INC.

Established : Dec, 26th in 2007

office: 5-9-5 Tokodai, Tsukuba Ibaraki 300-2635 Japan

Capital Stock : 72,980,000 Yen

Steering Members

Director:
Masayoshi Shimizu (MBA)
Setsu Suzuki
Keiji Ishibashi

Engineering Devision

CTO   : Dr.Keiji Ishibashi
Senior Engineer : Dr. Kisei Ri
Research Engineer : Dr.Toyohiro Chikyow

Materials innovation is the key to realize sustainable society

Wind generator With super magnet

Solar panel

Fuel cell in house

Super low power device and long life battery
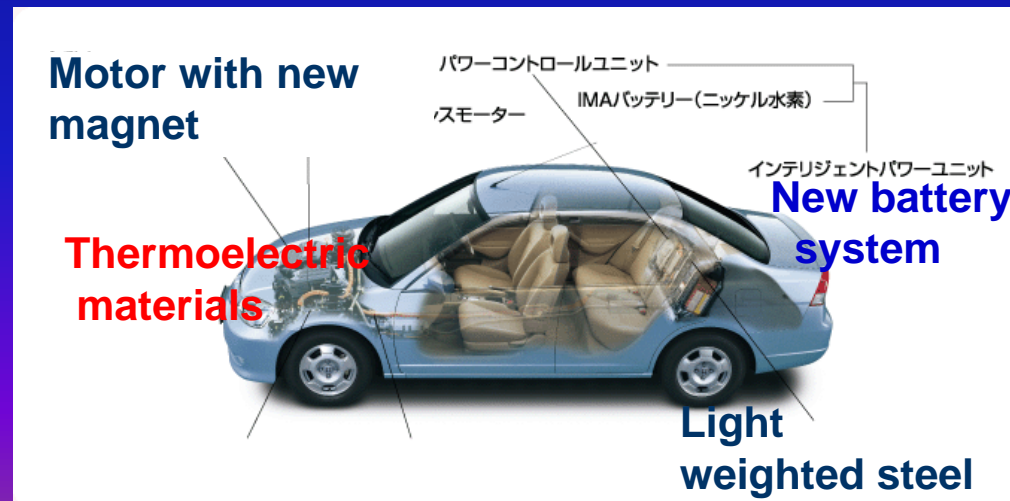
Motor with new magnet

パワーコントロールユニット

IMAバッテリー（ニッケル水素）

スモーター

インテリジェントパワーユニット

New battery system

Thermoelectric materials

Light weighted steel

New Materials Innovation in nano device

: Intel, IBM
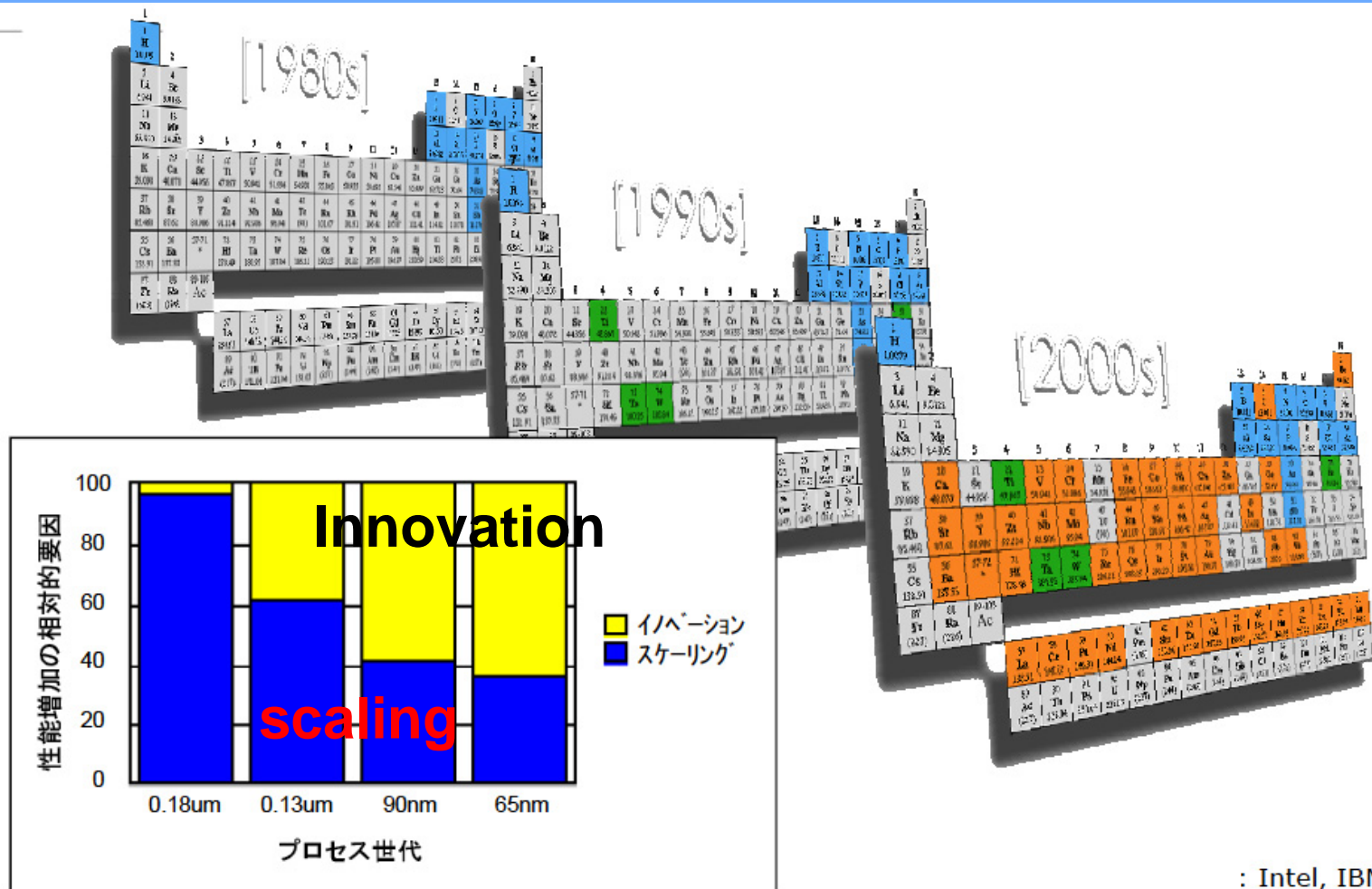
"Innovation" is driven by " new materials" !

Old Business Model

Basic Research Center (IBM Watson, Bell Lab.) → **R&D division** → **Production line** →

Present R&D Model

Materials Research ← COMET Business, briding seeds and application

University →

Venture →

Nat. Institutes →

Technology gap

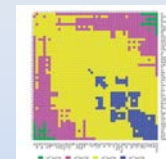**R&D (complicated and compromise)** → **Production** →

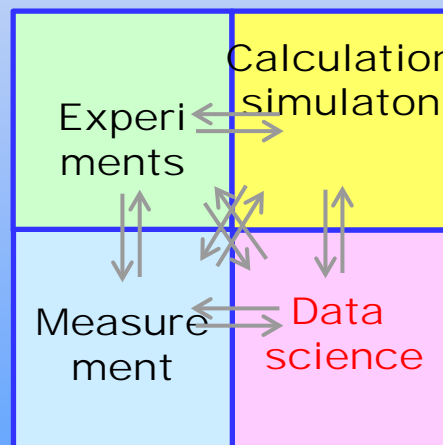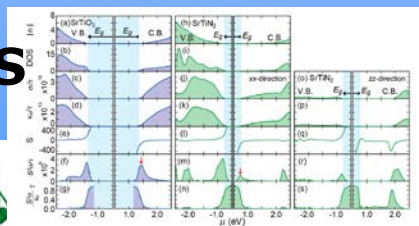# Reference１: two ways for new materials discovery

Induction

Results

Deductive way

Synthesis

design

Calculation simulaton

Experi ments

Measure ment

Data science

database

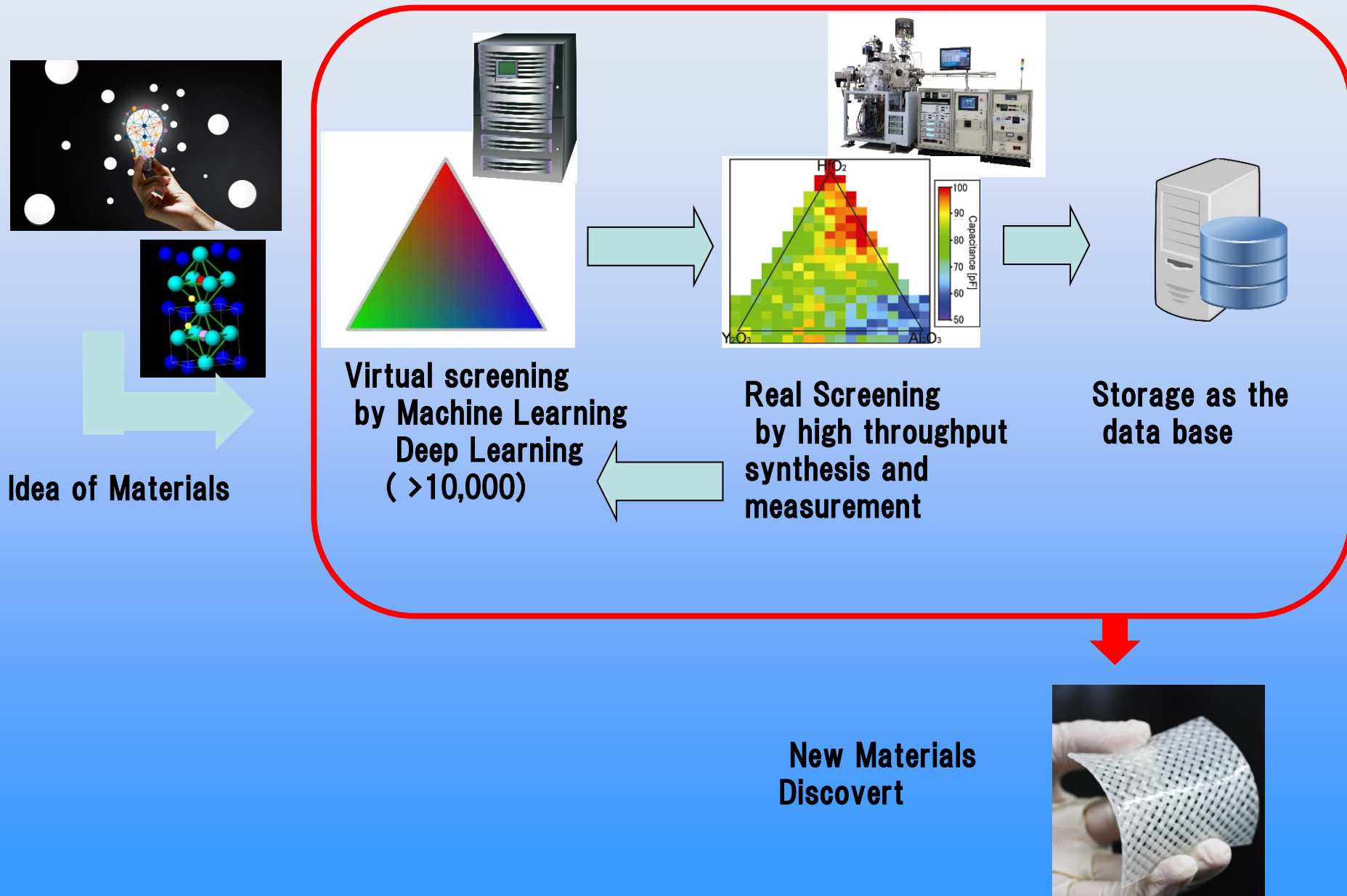**data accumulation**

synthesis

(a) SrTiO₃ (b) SrTiN₂
Sr
Ti
O
TiN layer
SrN layer
N2
Ti
N
Sr
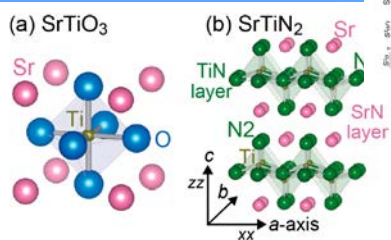
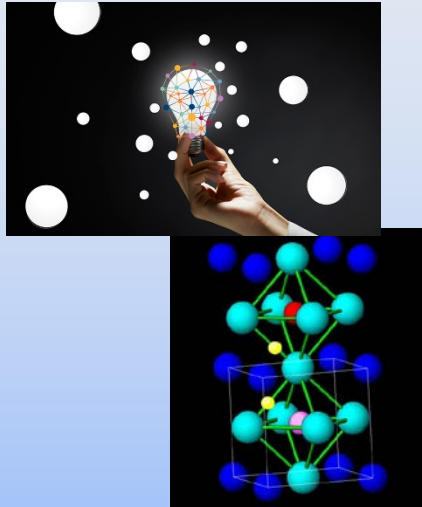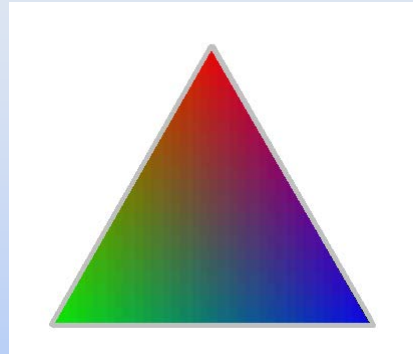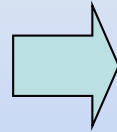# Modern process for New Materials Discovery

Vertial Screening for data: Materials Informatics

① **Design of Materials**

Proper Discripter

② **Vertial Screeing (>10,000)**
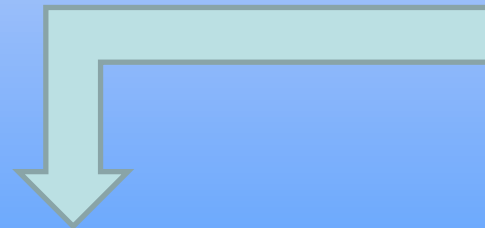
Enough data set

Materials Screening by MI
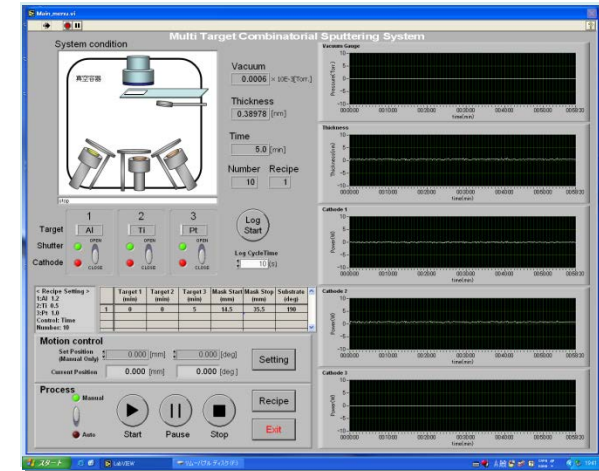
Super Computer

Data Base

Text data mining

Multi-targets Combinatorial Sputtering system
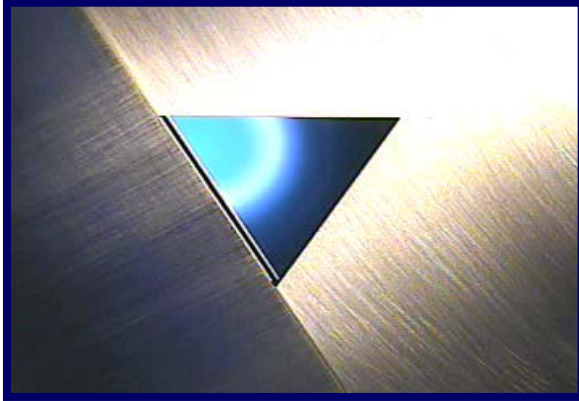

①GUI for every users
②automatic recording
　　（date、condition、
　　　materials）
③ connection to
　　　　　　　Internet
（Internet of things：IoT）
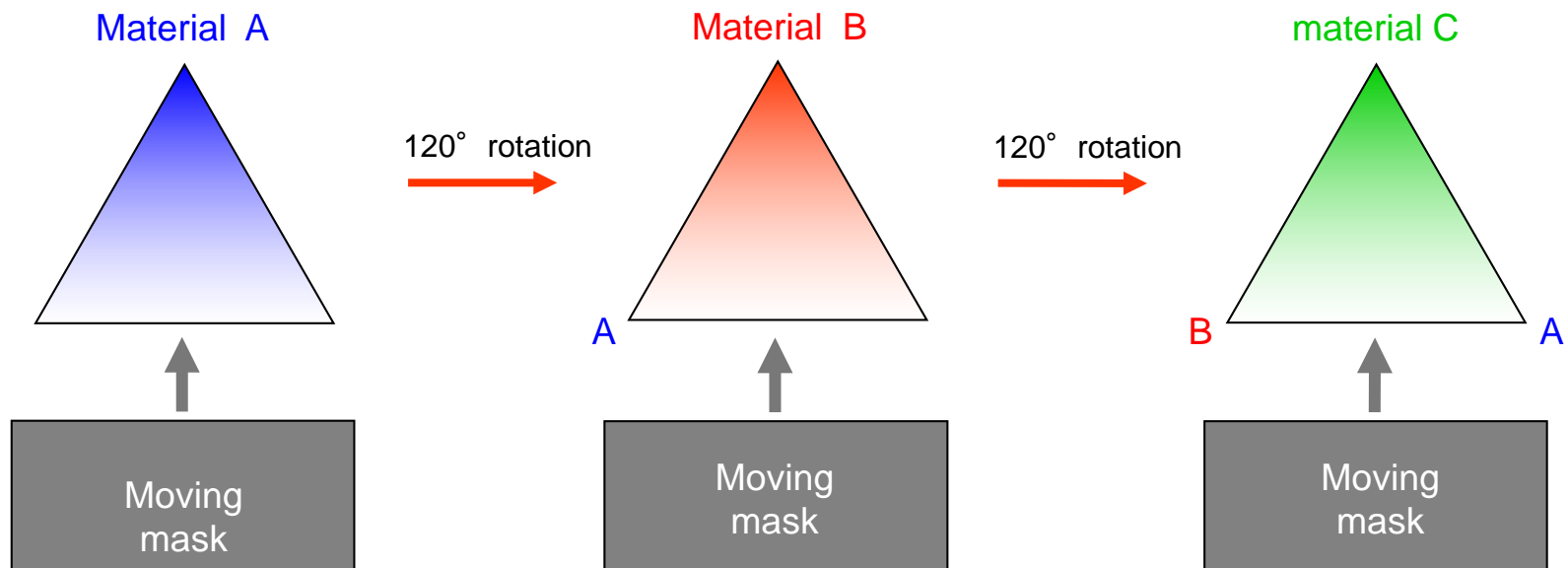
Appealing points:
- Full automated
- Ternary alloying in the same thickness
- 4 inch wafer is available.
- More than 10 equipment were shipped .

Automatic ternary alloying by combinatorial method

Composition spread

Combinatorial Sputtering system by COMET Inc.

Material A

120° rotation

Material B

120° rotation

material C

A

B   A

Moving mask

Moving mask

Moving mask

Repeat these synthesis process until getting the desired film thickness

Summary

☐ **New approach to materials science supported by machine learning or AI is proposed and it becomes the main stream.**

☐ **High throughput experimentation is inevitable to make " virtual screening " to " Real screening "**

COMET Inc.
The "state of the art" thin film combinatorial high-throughput development