

# TOWA ORIGINAL COATING

Variety type of coating for each function!!



# TOWA Coating Technology

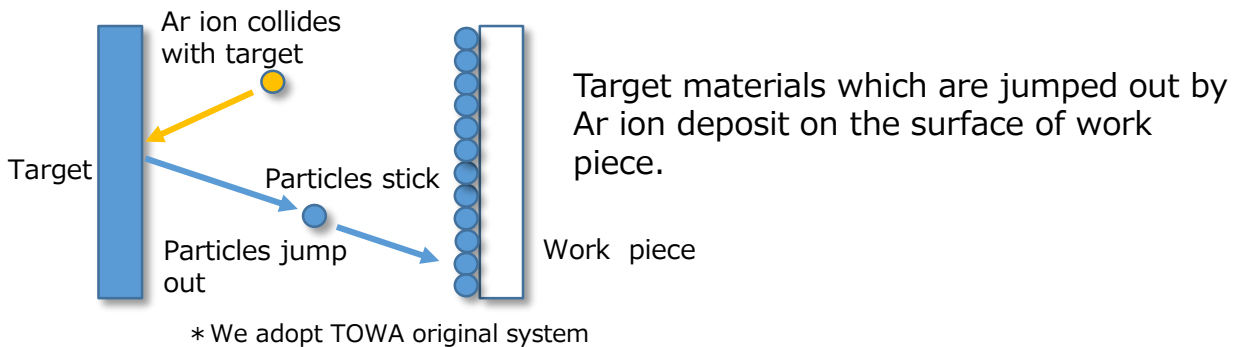
We use dry coating & wet coating of TOWA's core technology to contribute to all applications.

- ◆ Obtain approval for Food Sanitation Law and FDA law
- ◆ Meet SGS / RoHS standards

**FDA certification**  
US Food and Drug Administration

**SGS certification**  
RoHS Directive / ISO 9001

## 1 Dry coating (PVD/Sputtering method)



### Sputtering characteristics

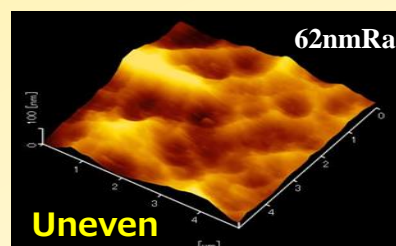
- Large energy of coating particles and strong adhesion
- Ultra-smooth surface & no droplets with precise coating method
- Enables coating for refractory metals, alloys & compounds
- Enables coating oxide and nitride by introducing reactive gas

#### \* Smoothness comparison result (AFM test)

**Sputtering method**  
TOWA's original coating



**Ion plating method**  
General coatings CrN, TiN, etc



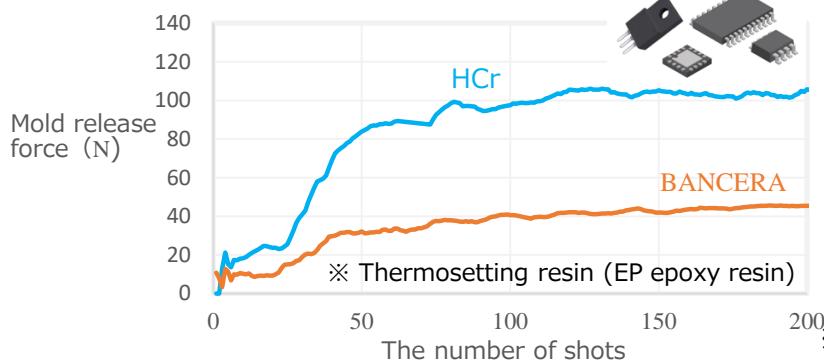
# BANCERA<sup>®</sup> Ceramic-based coating using sputtering technology

**Coatings that combine excellent mold release & antifouling**

- POINT 1** Improve productivity by excellent mold release ability & antifouling
- POINT 2** Hard to get dirty & easy cleaning by high water repellent
- POINT 3** Reduce problem of dust adhesion by excellent slipperiness & charge resistance

## Evaluation data

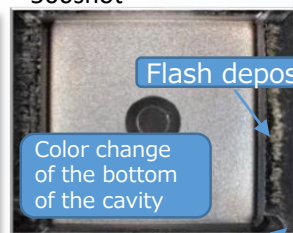
### ➤ Evaluation of release ability



**BANCERA**  
Continuous molding  
2,500shot



**HCr**  
Continuous molding  
500shot



Flash deposit

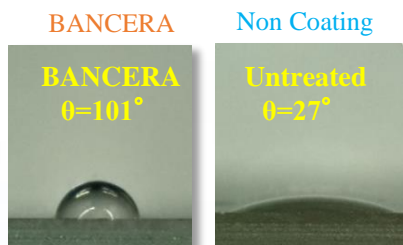
Color change  
of the bottom  
of the cavity

Resin sticking at air vent

※ Use resin with high adhesion (no release agent used at molding)

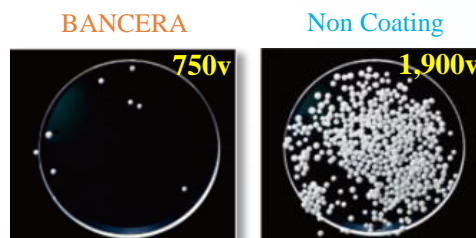
**Performance better than ever before compared to conventional coatings!**

### ➤ Contact angle



**High water repellency and superior antifouling property!**

### ➤ Charged potential measurement



**About 1/3 less charged than untreated!**

※ Amount of adhesion of polystyrene foam

## Characteristics and applications

Hardness [HV]	2440
Coating thickness [ $\mu\text{m}$ ]	$\leq 3$
Surface roughness [nmRa]	1.2-10
Contact angle [degree]	101
Coefficient of friction	0.13
Heatproof temperature [ $^\circ\text{C}$ ]	1000
Electrical characteristic [ $\Omega/\square$ ]	$10^9$
Processing temperature [ $^\circ\text{C}$ ]	400-450
Maximum work piece size [mm]	520x520
Color tone	Interference color

- Mold related  
Semiconductor molding, plastic molding  
Optical lens molding, rubber molding
- Tableting mold related  
Pharmaceuticals, ceramics, resins
- Powder transport parts related  
Shoot, Hopper
- Machine parts related  
Guide, Transport parts
- Glass parts related  
Tempered glass, heat resistant glass,  
Soda glass

# T-CrN

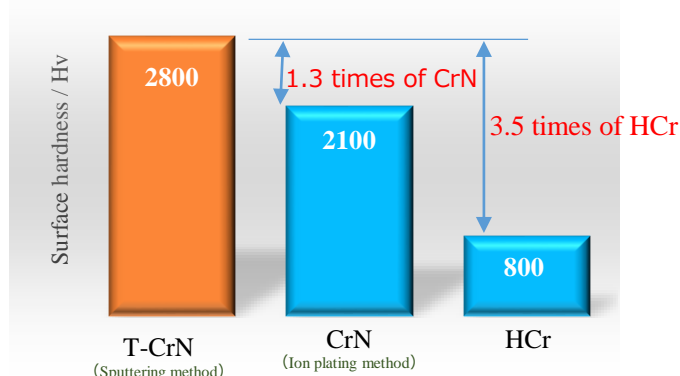
## CrN-based coating using sputtering technology

Coatings that combine high hardness, wear resistance, heat resistance and corrosion resistance

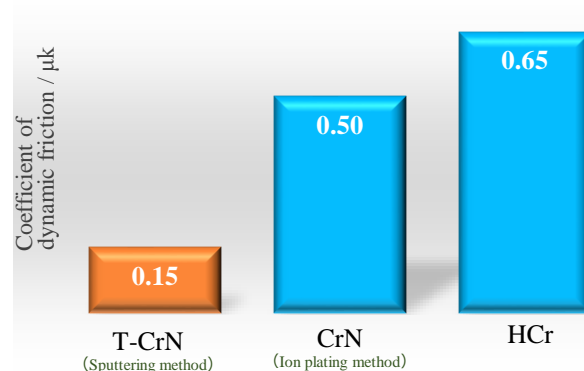
- POINT 1** Better wear resistance & durability than CrN of ion plated coating
- POINT 2** Precise coating with excellent corrosion resistance and no droplet
- POINT 3** Improved lubricity without losing heat resistance & wear resistance

### Evaluation data

#### Surface hardness



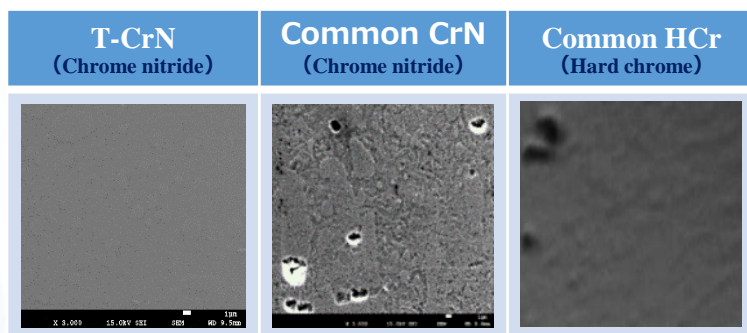
#### Coefficient of friction



Higher surface hardness and excellent scratch resistance than conventional CrN

#### Surface condition (FE-SEM)

FE-SEM observation result × 3000



Mold (semiconductor molding)

### Characteristics and applications

Hardness [HV]	2800
Coating thickness [μm]	≤ 2
Surface roughness [nmRa]	1.2-10
Contact angle [degree]	82
Coefficient of friction	0.15
Heatproof temperature [°C]	800
Processing temperature [°C]	400-450
Maximum work piece size [mm]	520x520
Color tone	Gray

- Mold related  
Semiconductor molding, plastic molding
- Rubber molding
- Punching die parts related  
Punch, die
- Mechanical parts  
Guides, Sliding parts
- Cutting tool related



# ***HARD STAR™***

AlCrN-based film using sputtering technology

Coatings that achieve high hardness, high heat resistance, & high adhesion

- POINT 1** Long life & dramatically improved wear resistance
- POINT 2** Excellent oxidation resistance, maintaining coating properties even at high temperature processing
- POINT 3** Protect molds and tools from heat generation & realize high efficiency & cost reduction

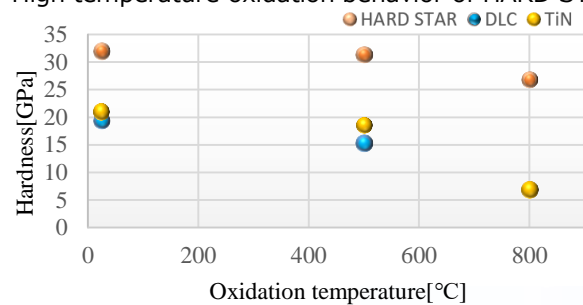
## Evaluation data

➤➤➤ Surface hardness

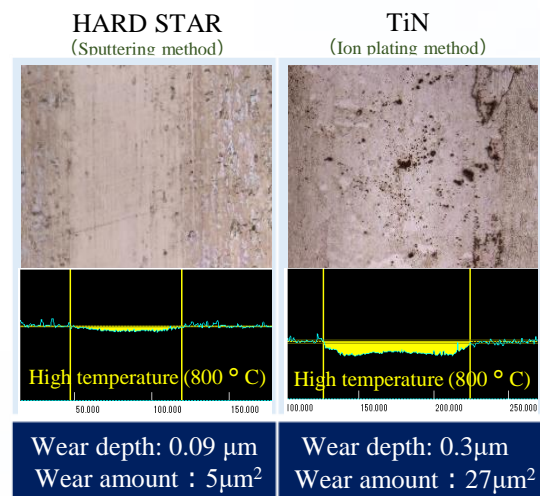


➤➤➤ High temperature friction test results

High temperature oxidation behavior of HARD STAR



Punching die



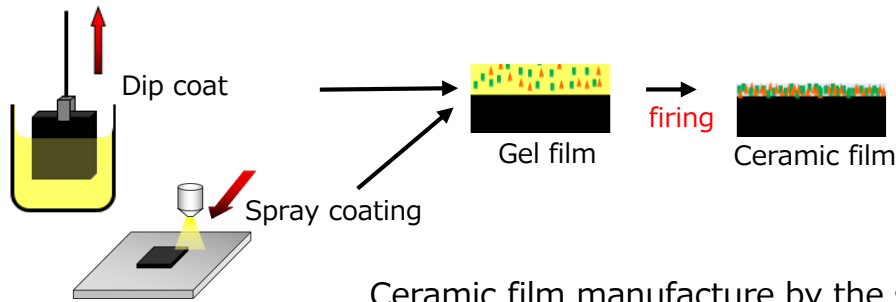
**HARD STAR has little wear even at high temperatures!**

## Characteristics and applications

Hardness [HV]	4000
Coating thickness [μm]	≤ 2
Surface roughness [nmRa]	-
Contact angle [degree]	-
Coefficient of friction	0.4
Heatproof temperature [°C]	1200-1300
Processing temperature [°C]	400-450
Maximum work piece size [mm]	100x300
Color tone	グレー

- Punching die parts related  
Punch, Die, Cutter
- Cutting tools
- Machine parts related
- Mold parts related  
Cold and hot working mold  
Die casting mold

## 2 Wet coating



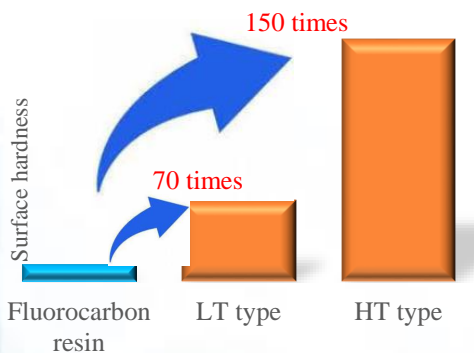
### **BANCERA<sup>®</sup> (WET-type)** Ceramic coating

Hard coating with high hardness and high scratch resistance

- POINT 1** Uniform coating possible on 3D shape and the inner wall of the cylinder
- POINT 2** Dimensions precision is maintained in correspondence with a micro pattern by nano level coating thickness
- POINT 3** More 50 times of durability & 150 times of hardness than fluorine resin

#### Evaluation data

##### Surface hardness

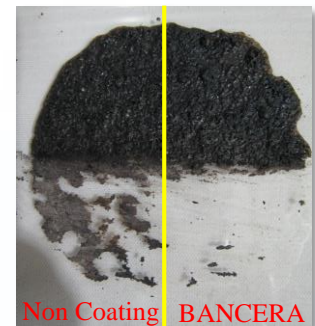


##### Burned test

<Test method>

Soy sauce 250 ° C x 30 minutes  
Wiping test after heating

It is hard to fall without a coating



#### Characteristics and applications

	LT type	HT type
Pencil hardness [H]	3	9 or more
Film thickness [ $\mu\text{m}$ ]	0.03-0.1	0.03-0.1
Contact angle [degree]	110	110
Transmittance [%]	90 or more	90 or more
Refractive index (635.86 nm)	1.90	2.04
Coefficient of friction	—	0.17
Electrical characteristics [ $\Omega / \square$ ]	$10^9$	$10^9$
Processing temperature [ $^{\circ}\text{C}$ ]	300-500	800
Maximum work piece size [mm]	300x300	300x300
Color tone	transparent color	transparent color

##### < HT type >

- Ceramic parts related
- Glass related  
Tempered glass  
Heat resistant glass

##### < LT type >

- Electronic component related  
Fine pattern
- Blade related

## Developing low temperature deposition in PVD / sputtering!

**From "glass" to "resin"**

**~ Coating that contributes to lightweighting ~**

By taking advantage of the characteristics of plastic, the effect of glass-like!



Plastic lens



Headlamp lens



Back camera lens

Color coating

Coatings that can change color tone, texture, and gloss



### Information

■ Constituents of BANCERA are stable oxide ceramics and do not contain corrosive halogens, elements such as Na and K, and harmful substances in the RoHS directive.

■ About recycling coating

Recycle coats for various coatings implemented by our company are possible.

■ About processing temperature

If the annealing temperature is 400 ° C or less, the processing temperature may affect the dimensional change and base material characteristics.

**Please provide the following information in advance in order to provide BANCERA with the highest quality.**

■ Work outer shape and material information

We will propose the optimum coating according to the shape and material of the workpiece to be mounted.

■ Work cleanliness

The adhesion of the coating is affected by the contamination at the time of processing or the contamination of resin residue etc.

We will consider pre-processing conditions. (Abrasive burn, white unevenness (oxide film), presence of rust)

■ If the mold surface has nickel, other company's Cr-based plating, other types of coating such as zinc plating and peeling treatment, and there is a black skin residue, the quality may not be guaranteed.



# Global Sales Network



## Production Base



TOWA Corporation  
Headquarters (Japan)



TOWA Corporation  
Kyoto East Plant (Japan)



TOWA Corporation  
Kyushu Work (Japan)



TOWAM Sdn. Bhd. (Malaysia)



TOWA (Suzhou) Co., Ltd. (China)



TOWA Korea Co., Ltd. (Korea)

### For information:

### Manufacturer:

## TOWA CORPORATION

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