Background of development of nanotechnology coating by Sketch

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1995 Participated in the nanotechnology coating business of TOTO, and served as a development partner for “Hydrotect,” a photocatalytic and super-hydrophilic self-cleaning coating.

1999 The photocatalytic coating did not deliver enough soil resistance for exterior components. Developed “Glass Barrier,” a super-hydrophilic self-cleaning coating focusing on an anti-static effect. With this as a springboard, Sketch entered into the R&D of inorganic binders and a variety of functional coating materials.

2000 Developed a heat-insulating, thermal barrier glass coating using Antimony Tin Oxide (ATO).

2005 - 2010 Developed a SiO_2- and SnO_2-based TB binder with anti-static, super-hydrophilic and self-cleaning effects. Developed a system that enables anyone to locally produce nano coating materials.

TB binder + TiO_2	→ Photocatalytic, anti-static and super-hydrophilic self-cleaning coating
TB binder + Indium Tin Oxide (ITO), ATO and carbon nanotube (CNT)	→ Improved anti-static effect
TB Binder + WO_3, Pt	→ Improved chemical resistance and hardness
TB Binder + Nano silver (Ag)	→ Antibacterial, anti-static, soil-resistant, and super-hydrophilic self-cleaning coating

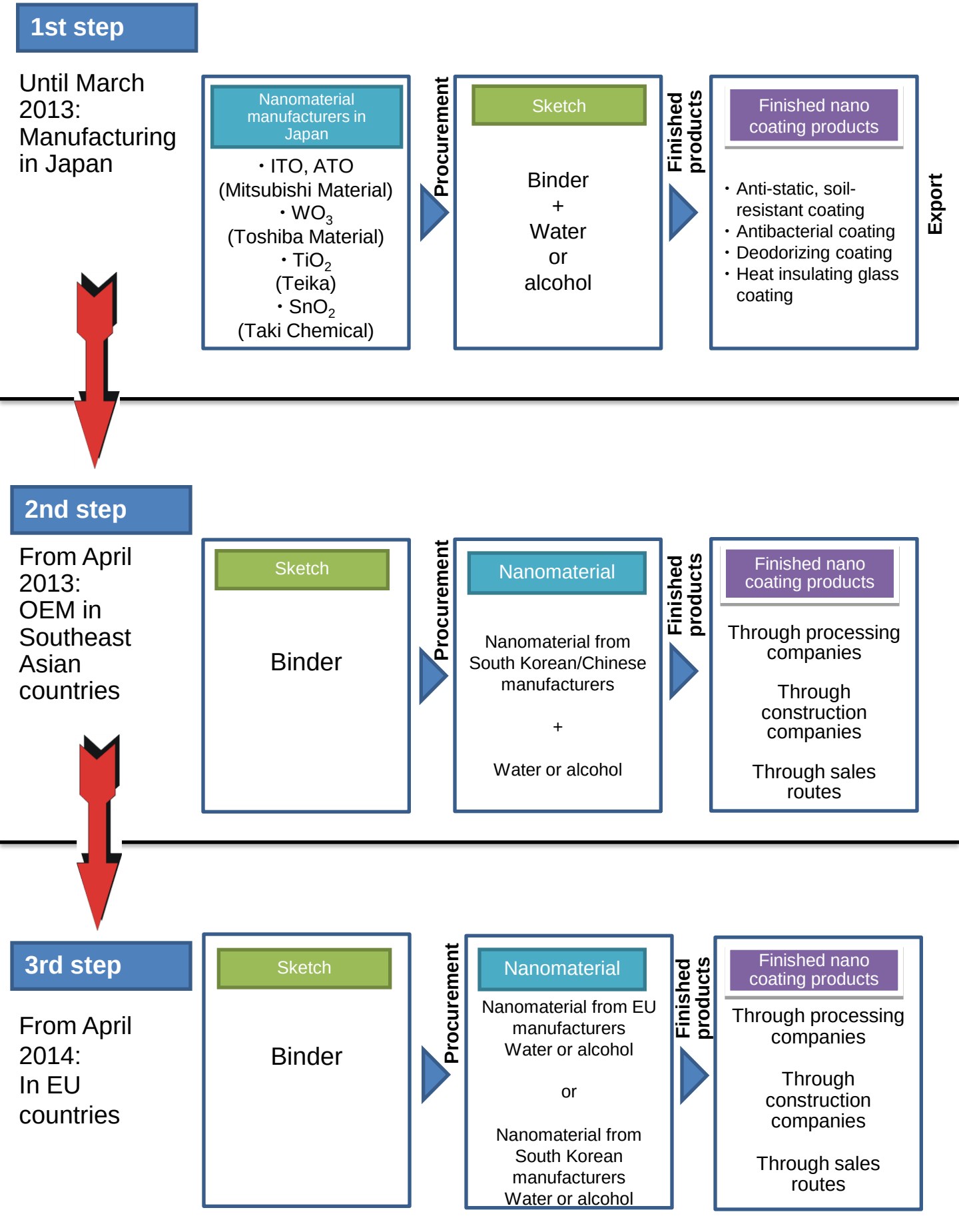
2011 After the Fukushima nuclear accident, heat-insulating, thermal barrier glass coating has enjoyed a popularity as a measure for saving power and cutting down on air-conditioning costs in existing buildings. It won a market share of 70% in Japan.
With a growing number of inquiries from China, South Korea and Southeast Asian countries, Sketch launched exports of products.

2012 A feed-in tariff system for renewable energy including solar power was started in July 2012. The market interests have shifted from power-saving to power-selling.
Sketch developed a “Solar cell self-maintenance coating,” offering a soil-resistant effect. We received more inquiries for coatings not only for solar panels, but also for the exterior window glass of buildings.

April - October 2013 With increased orders from China and Southeast Asian countries, Sketch launched exports of binders, not finished products, in October to minimize costs for manufacturing and marketing finished products. We shifted to an OEM system that locally produces finished products in combination with nanomaterials sourced from South Korea and Chinese manufacturers. This allowed Sketch to broadly expand overseas business such as into Thailand, the Philippines, Dubai, Vietnam, South Korea and China.

April 2014 With participation in an EU Seminar held on January 25 in Germany as a springboard, Sketch will launch local production in combination with our binder in EU countries in partnership with EU nanomaterial manufacturers.

(1) Establishing tie-ups with German partners who serve as a laboratory for Sketch.
(2) Developing functional nano coating through tie-ups with nanomaterial manufacturers.
(3) Promoting sales to processing manufacturers (with direct support from Sketch) (manufacturers of glass, tiles, aluminum panels, exterior components, concrete, etc.)
(4) Promoting sales in the construction-relevant field (mainly German partners).
(5) Selling coating materials to paint distributors and trading companies dealing in construction materials (mainly German partners).


1st step
Until March 2013: Manufacturing in Japan
Nanomaterial manufacturers in Japan
• ITO, ATO (Mitsubishi Material)
• WO_3 (Toshiba Material)
• TiO_2 (Teika)
• SnO_2 (Taki Chemical)
Procurement
Sketch
Binder + Water or alcohol
Finished products
Finished nano coating products
• Anti-static, soil-resistant coating
• Antibacterial coating
• Deodorizing coating
• Heat insulating glass coating
Export
2nd step
From April 2013: OEM in Southeast Asian countries
Sketch
Binder
Procurement
Nanomaterial
Nanomaterial from South Korean/Chinese manufacturers
+
Water or alcohol
Finished products
Finished nano coating products
Through processing companies
Through construction companies
Through sales routes
3rd step
From April 2014: In EU countries
Sketch
Binder
Procurement
Nanomaterial
Nanomaterial from EU manufacturers
Water or alcohol
or
Nanomaterial from South Korean manufacturers
Water or alcohol
Finished products
Finished nano coating products
Through processing companies
Through construction companies
Through sales routes

Sketch's binder technologies allowing for development of a variety of functional coatings

A variety of functional coating materials can be produced by changing the combination of the following nanomaterials:

Advantages of Sketch binder

(1) Excellent adhesion
(2) High transparency
(3) Curing at room temperatures
(4) 100% inorganic components
(5) Self-leveling
(6) Thin film

The world's most advanced nanomaterial manufacturers and research partners

ATO, ITO ..... Mitsubishi Material Group
Visible light responsive titanium oxide..... Ishihara Sangyo Kaisha
Titanium oxide, high dispersive titanium oxide... Teika
Tin oxide..... Taki Chemical Industries
Titanium oxide, silver ion... JGC Catalysts and Chemicals
Platinum nanoparticles.....Tanaka Kikinzoku Kogyo
Tungsten oxide..... Toshiba Material
Carbon nanotubes..... Mitsubishi Material, etc.

Sketch binder **10-%** + **Nanomaterial above 10-15%** + **Water or alcohol 70-80%** = **Finished product 100%**

Sketch's current product lineup

Infrared & UV cut coating	Heat insulating glass coat series	
Anti-static, soil resistant coating	Super Glass Barrier	
	Hyper Glass Barrier	(Self-maintenance coating for solar cells)
Long-term deodorizing, antibacterial coating	Refresh coating	Refresh silica coating

Overseas expansion in the future

Functions of Sketch binder

(1) Excellent adhesion
(2) High transparency
(3) Curing at room temperatures
(4) 100% inorganic components
(5) Self-leveling
(6) Thin film

Nanomaterial manufacturers in South Korea, China and EU

1. **ITO**
2. **ATO**
3. **CTO**
4. **WO_3**
5. **CNT**
6. **Ag**
7. **TiO_2**
8. **PT**

+
Water or alcohol

Local production of coating materials

Background of entry into nanotechnology business

Participation in the Hydrotect business of TOTO more than 15 years ago served as a springboard for Sketch to enter the nanotechnology business. At the request of Zenrin, a company that produces and markets maps and car navigation map software, we participated in the photocatalytic titanium oxide business of TOTO, and were engaged in the development of car films and body coatings with super-hydrophilic, soil resistant and self-cleaning effects. We delivered 3,500 sets of low-pressure spray guns made in the U.S.A. used for car body coating, and played a part in the launch of TOTO's photocatalytic coating business.

As summer weather heats up year by year because of global warming, there were growing needs for thermal barrier products for window glass, and openings of existing buildings. However, existing thermal barrier films were expensive and required some skill for application. Thus, Sketch has undertaken the development of alternative, easy-to-use thermal barrier coatings for window glass with twice as long life as thermal barrier films at half the cost.
Through participation in TOTO's photocatalytic coating business and development of thermal barrier coatings for glass windows, Sketch recognized a huge potential for growth of the nanoparticle technology market, and determined to make it one of our core businesses.

Concurrently, nanotechnology was positioned as a new industry by the Japanese government, and enjoyed popularity thorough coverage by various TV programs and other mass media. However, the nanotechnology industry at that time had many issues and challenges. Sketch was also in a difficult situation with one problem after another for the first five years since the start of the nanotechnology business.
Then, we realized that **the most important point in development of nano coating materials was to develop a 100% inorganic transparent binder with excellent adhesion**. Thereafter, we gave it the highest priority and successfully developed an inorganic adhesive binder that can be added to any type of nanomaterials five years ago. By utilizing the results, we now develop and manufacture a variety of coating materials such as anti-static, soil resistant coating, and deodorizing and antibacterial coating.

Future business developments

Sketch manufactures mainly "energy-saving glass coat," a thermal barrier coating for window glass, and "Super Glass Barrier," an inorganic super-hydrophilic coating with anti-static, soil resistant effects. By enhancing the hardness and chemical resistance of these two products, we also offer a self-maintenance coating for solar cells and other types of nano coating materials such as "Hyper Glass Barrier." We market these products not only in Japan, but also in China, South Korea, Southeast Asian countries and Canada.

As for the sales of thermal barrier glass coating (energy-saving glass coating) in Japan, we concluded an OEM agreement with 20 companies. In addition, we established two nationwide organizations under our direct control, Power Saving Eco Shop and Eco Business Club, that had 200 member companies. Together with these partner companies, we promote sales with uniform prices, and successfully won the largest share of the Japanese market.
Our anti-static, soil resistant coating that had undergone a five-year evaluation by Shimizu Corporation drew attention as a future soil-resistant coating. It has been introduced by many companies and construction projects such as Tokyo Big Sight.

We developed an anti-static, soil resistant super-hydrophilic coating dedicated to solar panels and glass in July 2012. With the high performance and reasonable costs of the coating material, we are promoting sales in China where many high-rise buildings with solar panels and glass windows stand side by side with the aim of introducing the use of our coating on a large scale as an alternative to fluorine coating.
In particular, we have shifted our focus from application coating to functional nano coating used in product processing, and are engaged in development of new functional coating designed for construction and road materials.
Sketch has developed a variety of functional coating materials through tie-ups with Japanese nanomaterial manufacturers. To further cut down on costs toward expansion into the African market through China and the Middle East market, we are planning to collaborate with nanomaterial manufactures in South Korea, China and the EU, and develop products destined for the overseas market at more reasonable cost through local production.
We are looking for partners who can tie up with us to develop products by utilizing our inorganic binder technologies in Southeast Asia, the Middle East, and EU countries.

Sketch's super-hydrophilic, inorganic adhesive binder technologies

Sketch is a manufacturer of an inorganic adhesive binder that cures at room temperatures. We are engaged in development and manufacture of nano coating materials that provide any type of substrates with a variety of functions such as transparency, thin-film formation, excellent adhesion, quick drying and self-leveling.

The following three technologies are needed to develop top quality nano coating materials:

(1) Technology to produce nanoparticles of metallic oxide and other chemicals in 10 nm size or less

Generally, it is easy to produce particles on a micron scale. However, to produce nanoparticles of 200 nm, particularly below 10 nm, requires tie-ups with leading chemical manufacturers in terms of facilities and costs.

Nanoparticles below 10 nm exhibit outstanding performance beyond comparison with those on a micron scale.

Chemical manufacturers in Japan are working hard on the development of functions of metallic oxide nanoparticles. Something that is just a dream today could be a reality tomorrow. Development of a new functional material brings about a great change in the industry.

(2) A technology to disperse metallic oxide nanoparticles within 50 nm evenly and stably to prevent primary and secondary aggregation.

Nanoparticles of 2 nm or even 10 nm immediately aggregate into those of 100 nm or 200 nm, resulting in a substantial decline in transparency and functionality. Dispersion is the most important factor that determines the technological abilities of chemical manufacturers.

Development of dispersion technologies requires broad expertise and a large amount of money. It is necessary to gain support from leading chemical companies, not trying to develop on our own.

Leading chemical manufacturers are most interested in to what extent a material that they are requested to develop will sell in the market. The most essential point is to provide information on the needs from specialists in a relevant field.

(3) A technology to develop a highly-adhesive ultra-thin film inorganic binder that makes full use of the individual functions of nanoparticles dispersed evenly and stably

It makes no sense to develop functional materials at great cost and effort if they do not firmly adhere to substrates requiring such functions.

For photocatalytic coating, in particular, the effects of coating greatly depend on the presence or absence of a suitable inorganic adhesive binder. It is necessary that the inorganic adhesive binder firmly adheres to a substrate, and that a functional material is arranged in an orderly way on the coating surface.

Only when these three technologies come together, can a highly-functional and multi-functional nano coating be developed. Sketch has promoted development with support from leading chemical manufacturers for technologies (1) and (2). As for (3), we successfully developed a room-temperature curing coating fluid that offers the thinnest film, reasonable cost and high-/multi-functions. This success has attracted remarkable attention from leading nano coating manufacturers.

We developed several types of silica binder blended with more than three types of metallic oxide on a 0.1μ to 0.5 μ scale to make full use of individual advantages.

One of the most noteworthy technologies is that a small amount of silica binder firmly bonds a substrate and functional materials. This allows for arranging an anti-static material in an orderly way on a coating surface, delivering the highest performance with half the additive amount as the ordinary binder. Japan is the most advanced country in the world in formation and dispersion of metallic oxide nanoparticles. It is expected that completely new nanoparticle technologies beyond the conventional concept will be developed and create a new market.

Sketch is developing room-temperature curing silica coatings accommodating a variety of functional materials, such as a visible light responsive titanium oxide-silica coating, anti-static, waterproof and soil resistant coating, anti-fogging soil-resistant coating, super-hydrophilic self-cleaning coating, mildew/algae proofing antibacterial coating, and heat-insulating thermal barrier glass coating.

Company profile

Company name	Sketch Co. Ltd.
CEO	Yasuhiro Shimada
Foundation	February 1989
Capital	50 million yen
Address Head Office:	3F, Chaco Paper Hall, 2-25-10, Asakusabashi, Taito-ku, Tokyo 111-0053 Japan TEL +81-(0)3-5825-6503 FAX +81-(0)3-5825-6504
URL	http://www.sketch.co.jp/index.html
Main banks	Mizuho Bank, Asakusabashi Branch Bank of Tokyo-Mitsubishi UFJ, Asakusabashi Branch
Scope of business	Development and manufacturing of nanotechnology coating using inorganic adhesive binder •"Energy-saving glass coating"…….Represents the largest market share, 70% •"Anti-static, soil-resistant coating"…Patent pending •"Long-term deodorizing anti-bacterial coating"
Main clients	ECO Business Club Co. Ltd. (100 member companies) ECO Shop 100 member companies and 20 OEMs • China, South Korea, Canada and Southeast Asia
R&D partners	Mitsubishi Material Group Sumitomo Chemical Co. Ltd. Osaka Titanium Technologies Co. Ltd. Teika Co. Ltd. Taki Chemical Industries Co. Ltd. JGC Catalysts and Chemicals Ltd. Tanaka Kikinzoku Kogyo Co. Ltd. Toshiba Materials Co. Ltd. Dainichiseika Color & Chemicals Mfg. Co. Ltd., etc.
Affiliated companies	ECO Business Club Co. Ltd. (a franchiser) Power Saving ECO Shop Co. Ltd. Japan Nano Coat Co. Ltd.