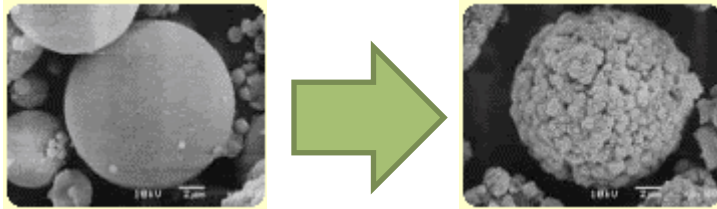


**Confidential**



Coal Ash

Artificial Zeolite

# Artificial Zeolite Production & Applications

(from waste to an untapped resource for zero-emission society)

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Presented by:

**Solid Corporation**

Osaka, Japan

# 1. Introduction

Global concern about the environment has become so serious that disposal of huge quantities of ash from the incineration of coal, paper sludge, municipal waste and activated sludge (drain water and sewage sludge) has become a big headache to every city and country around the globe. The only effective use for such ash has so far been for land reclamation.

As a result of the many years of research by Dr. Teruo Henmi, ash is no longer a menace but an untapped resource of great value. Our scientists have invented and developed processes to synthesize zeolite from ash.

Artificial zeolite has many useful properties such as large cation capacity, high adsorption capacity and catalytic functions. It is used for many purposes as described on the next slides.

## 2. Business Potential



- ① Covert ash into artificial zeolite where ash is available and to be disposed of.
- ② Manufacture environment-improving products
- ③ Market/apply environment-improving products

# 3. Overview of Applications

Zeolite has many useful characteristics, such as uniform intrinsic pore diameter, surface charge, ion exchange, adsorption and separation capability, opening the door to a wide range of applications in various industries as follows:

- Agricultural, forestry, livestock and marine
- Environmental conservation
- Civil engineering and construction
- Public health
- Desert greening and urban development
- Brewing, pharmaceutical and cosmetic
- Paper
- Rubber
- Food

## 4. Applications – as adsorbent

- Deodorant – removing foul odors and toxic components from the air
- Deodorizing livestock excrement
- Deodorizing toxic microorganisms and colloidal sludge in coastal waters, rivers, lakes, reservoirs and marshes
- Filtering medium in ventilators to remove odoriferous and volatile substances
- Controlling humidity in the air
- Preservative to keep agricultural products fresh
- Absorbing and hardening spilled and waste oil and reforming asphalt
- Purifying and decolorizing sewage and waste water
- Bactericide and fungicide
- Removing agricultural chemicals
- Increasing the functionality of concrete, mortar and secondary cement products

## 5. Applications - as ion exchanger

- Improving sandy (decomposed granite) soil to help plants, grass and vegetables grow bigger and healthier without excessive use of fertilizers and repeated spraying of agricultural chemicals
- Detoxifying soil by preventing excess accumulation of salt and micronutrients in the soil for plants' and vegetables' healthy growth
- Acid rain neutralization
- Constructing inexpensive and non-polluting artificial reefs and breakwaters to grow seaweeds
- Preventing efflorescence in concrete, mortar and secondary cement products
- Softening hard water
- Hydroponics

## 6. Applications - as catalyst, etc.

- Adsorbing and decomposing NO<sub>x</sub> from thermal power plants, plant boilers, automobiles, ships, aircraft, etc.
- Adsorbing and decomposing PCBs
- Adsorbing and decomposing endocrine disrupters such as dioxins and organochlorine compounds
- Deoxidizing organic and inorganic compounds
- Converting waste plastics into oil
- Eco-friendly concrete blocks

## 7. Plants in Japan and Cost Effectiveness

- There are several plants in Japan including Hekinan thermal power plant of Chubu Electric Power in Aichi Prefecture.
- As a rule of thumb, the cost of artificial zeolite synthesized in Japan is around USD 1.00 – 1.50 per kg.
- With its CEC (Cation Exchange Capacity) value several times higher than that of natural zeolite, artificial zeolite becomes an important recycled resource rather than mere waste. Many artificial zeolite-contained products are sold for a wide range of uses in Japan.

## 8. Step-by-step Procedures

- A party interested in production of artificial zeolite and/or manufacturing/marketing zeolite products is identified.
- Exchange of preliminary information between such party and us.
- Face-to-face discussions and technical and economic review of the feasibility of the project either in the country of the applicant or in Japan. The inventor of the technologies and the patent holder, the dean of the Agricultural Department of a Japanese national university, will also participate.
- A contract is executed by Solid Corporation and the applying party regarding the licensing and engineering/manufacturing or sale of the equipment with the patent holder signing as a technical advisor.

## 9. Contact

If interested in developing a project with us, please contact the following:

- Michael H. Kanagawa, Executive Advisor, Solid Corporation, at email address [mikek@proof.ocn.ne.jp](mailto:mikek@proof.ocn.ne.jp) or tel/fax 81-33443-8976 or cell 81-903-2323-523 or
- Shohichiro Tokuoka, President, Solid Corporation, at email address [tok\\_solidmen@hotmail.com](mailto:tok_solidmen@hotmail.com) , tel 81-6-6228-0577 or fax 81-6-6222-1287

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