

Jewelry Made of Rice

By Gunter Pauli

This article introduces a creative approach to jewelry as one of the 100 innovations that shape "The Blue Economy". This article is part of a broad effort to stimulate entrepreneurship, competitiveness and employment.

The Market

Rice is the second largest crop in the world after wheat. The world's output in 2010 was just under 600 million tons farmed on 155 million hectares by 250 million rice farmers. Unlike wheat (export 20%) and soy (export 35%) barely 7 percent of rice output is traded internationally. China and India are by far the largest producers, however all output is destined to local consumption. Thailand and Vietnam are the largest exporters. The consumption of rice per capita varies from an absolute high in Myanmar reaching nearly 200 kg per person per year, to a low in Europe of barely 3 kg and 7kg for the United States. There are an astonishing 120,000 varieties of rice representing the richest gene bank of any plant species. Unfortunately, most rice farmed is limited to 4 hybrid varieties, mainly developed in China.

Rice is first and foremost a staple food with its origins traced back to 6,000 BC. In addition to rice as a base food, its kernels, husks and straw are converted into oil, wine, cake, flour for baby food, cleaning product for jewelry, soap, insecticide, additive for cement, abrasives, fuel, mold control, thermal insulation, and substrate for mushrooms, just to mention a few from a long list of derivatives. Rice is not very rich in protein, but has the right mix of amino acids which combined with nuts and soy sauce offers a complete range of nutrients. There are an estimated 140 million tons of rice husks dumped or burned annually. And since the pressure to raise rice output increases, the output of husks is also growing. While rice husks have been mentioned in Case 54 as part of a scheme to resolve packaging, the husks are a major renewable source of silicon oxide (SiO_2) which can be converted to silicon carbide (SiC) using the excess of carbon from the same biological source.

Rice husks are made from opaline, lignin and silica. The lignin is an ideal fuel so the husks can be converted using the oxygen at 550 degrees into a high value added product bringing its own energy source. Silicon carbide does not melt, has excellent heat and electric conductivity properties, it has a very low coefficient of thermal expansion and is chemically inert. Each ton of paddy rice generates 50kg of silicon carbide. Even though silicon carbide has 250 different crystalline forms, industrial standardization has advanced thanks to a rise in demand from defense industry (SiC is the raw material used in bullet proof armor), electronics (SiC is poised to become a key component of printed circuit boards) and

renewable energy (SiC is used for making photovoltaics). The leading producer of SiC in the world is the Murugappa Group from India with a turnover of \$3.4 billion, competing with Wacker Chemie (Germany) and Washington Mills (Norway).

The Innovation

Traditionally, silicon carbide, also known as carborundum, is made from cokes, clay or sand. This energy intensive process relies on mining both raw materials. In view of the increased demand, production has been expanding with an investment of the Murugappa Group in the largest plant in the world with an output of 100,000 T per year. However, the key challenge remains the stable price levels which are dependent on demand from just a few sectors. Also, if and when the new generation of electronics comes on stream, demand would rely increasingly in mining, whereas the large majority of rice husks continue to be dumped and incinerated without a chance of value addition.

Remi Ie, the Princess from Okinawa, proposed to make silicon carbide jewelry and consulted with two rice experts. Indeed, if one masters the crystal formation, and eliminates the impurities, then silicon carbide can be turned into a colorless transparent stone shape. She remembers how the pearls emerged from an expensive and exclusive product into a \$ 3 billion dollar industry in 2010. The harvesting of pearls, has been compared to the growing of gold. When the first SiC stones were handed to her, and Remi had them set into a golden ring tailor-made to the shape of the stone, she realized that SiC could not only become a broadly used industrial raw material, but could respond to the demand for price competitive jewelry much along the lines that the Japanese (and then the Chinese) revolutionized the availability of pearls to the world.

The First Cash Flow

The entry into the market pursues best a skimming strategy, reach for the small volume high value added market. Just like pearls were for the wealthiest only, today a mid-sized pearl can be purchased for a little as \$4 wholesale, while the higher quality Tahiti variety fetches \$30 per unit. This is the opportunity that presents itself: how to take a small nation or region, work on the technology to produce unique SiC stones. Remi has decided that her trial domain will be Bhutan as part of a broader scheme to ensure that the rice farmers and the farm communities have a better revenue, while offering a superior product at a competitive price. The plan is to have the first series ready by July 2012 for presentation in Bumthang.

The Opportunity

Pearls, carefully grown calcium carbonate, is not only used as a jewel. Crushed pearls are medicinal due to their high alkalinity, used in cosmetics and paints. The world has come from an over-exploitation of mussels and oysters to a cheaper and stable supply. SiC-stones would not emerge out of a farming technique that had to overcome overharvesting of the wild, and pollution of the waters, rather it would evolve from an abundance of resources with a final product derived from an estimated 20 million tons of rice husk ash. If the SiC stones would match the 1,500 tons of cultured pearls that the market bought in 2010, then we are looking for a major injection of revenues into rural areas, provided the technology embraces the small scale high value local industry concept that has characterized many of the industries like pearls. This is one of the core concepts of the Blue Economy.

Pearls have become a commodity, and jewelry has emerged into this massive +25 billion dollar global industry. The real opportunity is to create art, culture and jewelry centers since it is never possible to create twice the same SiC stone and as such turn this perceived waste into beauty. This is one of the greatest transformations we can achieve in our modern day society.

GUNTER PAULI



The Blue Economy

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Please contact info@zeri.org