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Materials for Energy and Environmental Applications

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Abstract

Energy related materials research at Chalmers spans across the full spectrum of energy production, transport, storage and conversion. All aspects from material synthesis and characterization to integration of these materials into devices are covered and target global energy challenges. We need to bring in use of those materials which meets the need of both energy and environment applications. Technology, cost, environment are the main hurdles to cross to meet the desired product. Bringing new product to market involves a lead time and the biggest contribution is the quest for new materials.

Asphalt rubber shorten breaking distances and reduces road maintenance as UCS blueprints are used to increase the fuel efficiency and safety of our nations vehicles from better truck design to reimaging the family minivan to building a better SUV. Copper Zinc tin sulphide nano particles help form a solar cell that would cost less and perform well. Titanium used in pipes in the nuclear, oil and chemical industries where corrosion is likely to occur. It is also used in heat exchanger tubing in liquefied natural gas plants and in the linings of the pressurized vessels in LNG tankers.

Keywords: Full spectrum, materials, Asphalt rubber.

1. Introduction

The global challenges in terms of energy and climate are to meet targets on reduction in carbon dioxide emissions, to achieve long term security of energy supply and to retain economic growth. These challenges require new technologies for carbon capture and methods of energy storage. In each of these arenas, new products to market and then encouraged to diffuse as replacement to community. Its goal is to moderate the effects of technology on atmospheric composition and climate change. Between 1980

and 2007 world total carbon dioxide ($C0_2$) increased from 18.3Pg to 28.2Pg. The EV blue print aims to slash emissions from Europe's biggest polluting industries and to produce 20% of Europe's energy from renewable energy from renewable sources.

2. Literature Review

Asphalt rubber pavement was promising concept that a few agencies were working with, but many others were not ready to implement it on a grand scale. It is the largest single market for ground rubber, consuming an estimated 220million pounds; or approximately 12million tires. California and Arizona use the most asphalt in highway construction (over 80% of asphalt rubber utilized).It has (I)longer lasting road surfaces (ii)reduced road maintenance and lower road noise (iii) cost effectiveness over the long term (iv)shorter breaking distances and in automotive parts, reduced tire noise levels (v)agricultural and horizontal applications/soil amendments.

2.1 Characteristics in cold regions

- Improved resistance to load-induced tensile cracking and to low temperature cracking.
- Improved skid resistance under icy conditions.
- Good resistance to studded tires and/or chains.

CZTS (Copper zinc tin sulfide) Nano particles are investigated and understood for their unique size dependent electrical and optical properties. It is a promising earth abundant material for low cost thin films solar cells. A facile less toxic, highly concentrated synthetic materials utilizing the heretofore unrecognized has been reported, easily decomposable caping ligind of triphenyl phosphate where phase pull, single crystalline and well-dispersed colloidal CZTS nanocrystals were obtained. $CuInGSe_2$(CIGS) and $CuInSe_2$(CIS) has been used as absorbent layer in solar cell production because of their high conversion efficiency 20% but the utilization of these materials in large scale solar cell production could cause an environmental problem due to toxic nature of selenium and expensive raw material. They are earth-abundant environment friendly non-toxic, pollution free optimum band gap of 1.4-1.5 E.v (suitable for photovoltaic application) has high absorption coefficient $<10^4$ cm^{-1}((R.L. Porter).

For formation of CZTS Nanoparticles the required chemicals, $(C_5H_8O_2)_2$.Cu, $(C_5H_80_2)_2SnBr_2$, (CH_3COO) 2Zn.2H20 and $H_2N.CS.NH_2$ were purchased from sigma Alde rich which are available and with no need for further purification. Titanium is established for use in source of the most severe environments in many industries including the chemical process industry refineries in the utility industry in utility steam condenser. It is a material for the prevention of corrosion, offers in weight saving, replacement cost. It is 60% more dense than aluminum, but more than twice as strong as the most commonly used 6061-T6 aluminum alloy. It loses strength when heated above 430°C. It is fairly hard, non-magnetic and a poor conductor of heat and electricity. The pulp and paper industry uses titanium in process equipment exposed to

corrosive media such as sodium hypochlorite or wet chlorine gas: other applications include ultrasonic welding, wave soldering and sputtering targets goods, tennis rackets, golf dubs, and football helmet grills and bicycle frames. Due to its extreme corrosion resistance, its containers have been used for the long term storage of nuclear waste (containers lasting over 100,000 years are possible under proper manufacturing conditions to reduce defects in the process). (Ankur khare).

3. Methodology

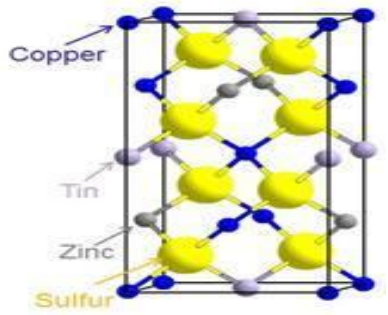
Scrap tire are collected by tire processors then it is grounded and all metals and fibers are removed. The crumb rubber is packaged in 20LB super sack is labeled with its exact height and other pertinent information. Rubber modified liquid asphalt binder is made for mix design in the lab by blending crumb rubber and unmodified blinder. The mix design procedures. Little or no modifications are required at the contractor's asphalt rubber. The blending unit is utilized to make rubber-modified asphalt blinder at the asphalt plant. The blending unit is connected to a tanker that pumps unmodified liquid asphalt blinder into the blender. Rubber is added to the liquid asphalt blinder. Rubber modified liquid asphalt is blended and pumped into hot mix asphalt plant. The entire process takes about 45min and makes approximately 6500gallons of rubber modified asphalt blinder per batch. Different testing such as viscosity and hot mix asphalt is tested by lab technicians. Rubber-modified hot mix asphalt is placed on the rod using standard paving equipment. Steel wheel rollers are recommended but rubber tired roller may be used for finished rolling.

(i) **(ii)** **(iii)**

Fig. (I): Pot hole or pothole image of a broken cracked asphalt pavement with a dirty water puddle as a transportation symbol of road maintenance.

The first step is the production of sponge which involves the chlorination of titanium containing rutile ore. Chlorine and coke are combined with rutile to produce (Titanium tetrachloride $TiCl_4$) which is then reacted with magnesium in closed system. Using the vacuum, distillation process, the magnesium and mag chloride are removed to be recycled. The by-product obtained sponge is melted with scrap or alloying element such as vanadium, aluminium, tin, molybdenum in a vacuum arc reduction furnace or in an electron beam to produce re-melts electrodes which can be then be

VAR melted or direct cast to slabs. Mill products result from the rolling or further processing of forged or cast slab or billet into titanium plate, sheet bar, rod and titanium wire forms.



4. Result

The result is a flexible solar cell that works well with low levels of light, polarized light as with reflections off snow, water or windows and light at very narrow angles as in the Arctic/Antarctic. Cost can be very competitive. Different designs and materials will be optimized for various operating conditions. If the cells need to operate at high temperatures, or need to be flexible then thin film technologies (including CZTS) may be favored, if efficiency is of more importance then this may swing the pendulum towards a silicon / organic tandem cell.

References

[1] (Shockley)W. U. Huynh, J. J. Dittmer, and A. P. Alivisatos, Science 295, 2425 (2002)

[2] http://www.sut.ac.th/engineering/metal/pdf/Nonferrous/05_Titanium%20and%20titanium%20alloys.pdf

[3] De Vos, "Detailed Balance Limit of the Efficiency of Tandem Solar Cells," J. Phys. D 13, 839 (1980).

[4] B. Sorensen, "Renewable Energy: A Technical Overview," Energy Policy 19, 386 (1991)