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Global trends of ecomaterials for food and fuel

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Recently, daily newspapers surprises us everyday because of the unbelievable increase of the prices of food, fuel, and materials such as gold, silver, and steel. The production cost of iron per ton increases 130 US$compared to that in 2007. Major factors are the increases of the imported coal, iron scrap, and iron ore, which are associated with the global warming.

The followings are the some introduction of the reports of the “Worldwatch Institute”, and “Renewables2007 Global Status Report” “for a sustainable eco-world. REN21 "Renewables 2007 Global Status Report"highlights that the industry broke all past global records, installing 5, 244megawatts (MW) of new energy capacity in 2007, or 30 % of all new US capacity added. This brings the cumulative national total close to `17, 000MW- enough to power more than 4.5 million US homes. The United States invested more than US$10 billion in new renewable capacity in 2007, coming in the third behind Germany and China. Most of this went to new wind power installations and photovoltaic cells.

World biofuels production rose 28% to 44billion liters in 2006; fuel ethanol was up 22 % and biodiesel rose 80%.Although biofuels comprise less than 1% of the global liquid fuel supply, the surging corn prices have benefited some, but have caused a host of other problems of air and water pollution as well as the loss of economically important recreation and hunting area. The United States, Brazil, and China continues to lead the world in production and use of ethanol. The industry had about 6.9 billion gallons (more than 26billion liters) of annual production capacity in 2007 - a 60% increase over2005 - and most gasoline in the United States is now blended with ethanol (up to20% in 2010 year). Current biofuels production methods place a heavy burden on land and water resources, due in part to the fossil fuel- and a chemical-intensive corn that is used to produce over half the world's ethanol. The increase in world agriculture prices causes of the world's rural poor, according to the Worldwatch Institute. This biofuels alone will not solve the world's transportation-related energy problems, however, ecomaterials and design for the dramatic improvements in vehicle fuel economy should be carried out for global potential and implication for energy and environment. Today's higher prices may allow them to sell their crops such as corn, cotton, and sugar, but go to the world's 800 million undernourished people, most of whom lives in rural areas.

Keywords: ecomaterials

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CMOS SCALING AND GATE STACK TECHNOLOGY PROGRESS

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In this presentation, efforts to extend the lifetime of CMOS technology will be reviewed along with impact on device performance and reliability. After 30 years of aggressive downsizing of transistors, geometrical scaling has clearly reached fundamental material limits, and is now in the era where further scaling can be realized mainly by new materials and/or device architecture. Traditional gate stacks based on SiO2 and poly-Si are now being replaced by high-k and metal gates. Strain engineering by means of SiGe in source-drain regions along with stress inducing layers are options being practiced since 90nm generation to boost mobility in the channels. New approaches to form low resistance ultra-shallow junctions with high active dopant concentrations are under investigation and likely to be employed in the next generation devices. Options to reduce barrier height of source-drain contacts are also under evaluation. All these options require integration of novel material systems on to a traditional Si platform, and are challenging from an implementation and reliability perspective.

The near term approach to extend CMOS lifetime is to import new gate stack materials such as high-k dielectrics and metal gate electrodes in to traditional CMOS device structures. Recent reports show that the major technical issues impeding the implementation of alternative gate stack materials have been solved. In this presentation, major process and integration approaches and issues will be introduced and the reliability status of the-state-of-the-art devices from this approach will be summarized.

Keywords: high-k dielectric, metal gate, CMOS