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# IMPACTS OF CLIMATE CHANGE OVER LARGE SCALE

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## Introduction

Science and Technology have always been an integral part of Indian culture. Natural philosophy, as it was termed in those ancient times, was pursued vigorously at institutions of higher learning. The Indian Renaissance, which coincided with our independence struggle, at the dawn of 1900s witnessed great strides made by Indian scientists. This innate ability to perform creatively in science came to be backed with an institutional setup and strong state support after the country's independence in 1947. Since then, the Government of India has spared no effort to establish a modern S&T infrastructure in the country. The Department of Science and Technology plays a pivotal role in promotion of science and technology in the country.

According to the present invention there is provided a thermal barrier coating wherein multilayers of (I) a $ZrO_2$ layer containing a luminous activator and stabilized by $Y_2O_3$, CaO, MgO or a mixture thereof and (II) a $ZrO_2$ layer containing a luminous activator different from that used in (I) and stabilized by $Y_2O_3$, CaO, MgO or a mixture thereof, or a $ZrO_2$ layer not containing a luminous activator and stablized by $Y_2O_3$ are stacked, and the layers at least under an uppermost layer opposite to a base member to be protected have a total thickness sufficient for exhibiting a thermal barrier effect. The present invention has as its object to provide a thermal barrier coating which allows non-destructive testing to determine whether it has a thickness sufficient for themal barrier effect.

## Causes of Climate change

### a)Burning fossil fuels

BURNING fossil fuels leads to greenhouse gas emissions that cause global warming. The consequent thermal expansion of ocean water and the melting of

glaciers and ice sheets raise sea levels, which will continue for millennia. Under unabated warming, sea level rise may exceed 130 cm by 2100. Climate scientists at the Potsdam Institute for Climate Impact (PIK), Germany, explored whether unprecedented geo-engineering such as pumping water masses on to the Antarctic continent could be used to mitigate the effects of climate change.

The problem from an ice-dynamics perspective, using state-of-the-art computer simulations of Antarctica. Since the ice is continually moving, ocean water put on its surface can only delay sea level rise, and if it is placed too close to the coast, ice-sheet mass loss and thus sea level rise after some time could even increase. As a consequence the water has to be pumped a long way, at least 700 km, inland on to the Antarctic ice sheet. But the ice sheet is up to 4,000 m high. Pumping so much water that high up would require enormous amounts of energy (more than one-tenth of the present annual global energy supply to balance the current rate of sea level rise). Antarctica is very windy, so the power for the pumping could in principle be generated by wind turbines; yet this would require building roughly 850,000 wind energy plants. The costs would be much higher than those associated with local adaptation studies, though these by definition are limited in scope and scale. So, rapid greenhouse gas emission reductions are indispensable if sea level rise is to be kept manageable.

**b) Plastic wastes merge in oceans**

In 2010, about eight million tonnes (mt) of plastic waste ended up in the oceans of the world, according to a report supported by Ocean Conservancy and published in the latest issue of Science by Jenna Jambeck of the University of Georgia in Athens, along with United States and Australian scientists. Warning that the cumulative amount could increase more than tenfold in the next decade, they have called for improved waste management practices the world over.

The researchers studied the sources of ocean-bound plastic around the world and developed models to estimate their annual contributions. They said that coastal countries generated close to 275 mt of plastic waste in 2010, of which 4.8-12.7 mt made its way to the oceans. While it was known that a considerable amount of plastic waste does end up in the oceans every year, researchers did not have an estimate of the quantity. This study has not only put a number to it but also identified the major sources of it around the world. It has listed 20 countries—from China to the U.S.—that contribute the most.

The estimate of 8 mt of plastic waste is equivalent to five grocery bags filled with plastic for every foot of coastline in the world, according to Jenna Jambeck. Given that this annual input increases each year, their estimate for 2015 is about 9.1 mt. And the researchers estimate that in 2025, the annual input would be about twice the 2010 input, which means that the cumulative input by 2025 would equal 155 mt.

In their modelling, the researchers combined data on solid waste from 192 different coastal countries with factors such as population density and economic status. They found that uncaptured waste—trash that is littered or lost from waste management systems—was the biggest source of ocean-bound plastic debris in the world. According to the researchers' models, a country's population size and the quality of its waste management systems largely determine the amount of such mismanaged waste that it generates which goes uncaptured and enters the marine environment.

**Impact on Climate change**

RISING temperatures due to global warming might result in more snowfall in Antarctica. A recent quantification through climate model simulations by an international team of scientists from Germany, the Netherlands and the United States, led by the Potsdam Institute for Climate Impact Research in Potsdam, Germany, shows that each degree of regional warming could increase snowfall on the ice continent by about 5 per cent. But the research also shows that stronger snowfall will increase future ice discharge from Antarctica.

The work has been published in a recent issue of the journal "Nature Climate Change". Their research builds on high-quality ice-core data and fundamental laws of physics captured in global and regional climate model simulations. The results provide a missing link for future projections of sea-level rise because of the contribution by Antarctic snowmelt.

Global warming leads to more precipitation as warmer air holds more moisture and in cold Antarctica this takes the form of snowfall. Hence, earlier research suggested that the Antarctic ice sheet might grow under climate change. The research, however, also shows that the increase in snowfall will not save Antarctica from losing ice since a lot of the added ice will be transported out into the ocean by its own weight. That is, warming brings more snowfall, more snowfall enhances ice loss. Ice-cores drilled in different parts of Antarctica provide data that can help us understand the future.

"Snow piling up on the ice is heavy and presses down—the higher the ice, the more the pressure. Because additional snowfall elevates the grounded ice sheet on the Antarctic continent but less so the floating ice shelves at its shore, the ice flows more rapidly into the ocean and contributes to sea level. Accounting for this effect, a 5 per cent increase in snowfall on Antarctica would mean a calculative drop in sea level by about three centimetres after 100 years. Other processes, however, will effect a net rise in sea level in the end.

**Precautions of Climate change in recent trends**

*** By using Ceramic thermal barrier coatings**

In a thermal barrier coating system, a bond coating disposed between a substrate and thermal barrier coating, wherein: the bond coating is a single layer bond

coating;said single layer bond coating having a thickness and having been formed by air plasma spraying with powder particles in a size range of -140 to +230 ASTM standard mesh size to provide a bond coating outer portion away from the substrate with a surface roughness in a range of about 200-600 microinches and as applied having pores; said outer portion having a thickness less than the thickness of said single layer bond coating; andsaid outer portion including a metal selected from the group consisting of Al and its alloys diffused into the outer portion to provide an Al-rich metal outer surface of imposed oxidation resistance in said single layer bond coating and facing the thermal barrier coating;said outer portion having an interface with the thermal barrier coating of a roughness in a range of about 200-600 microinches $R_a$ and as applied includes less than about 12wt% Al; andwherein the thermal barrier coating is a ceramic oxide selected from the group consisting of oxides of Zr, Y, Mg and their mixtures and combinations.

4. The bond coating of claim 3 in which the Al-rich metal outer surface is an aluminide.

5. The bond coating of claim 4 in which the bond coating comprises anMCrAlY alloy in which M is selected from the group consisting of Fe, Ni, Co and their mixtures and alloys.

Ceramic thermal barrier coatings (TBCs) offer the potential to significantly improve efficiencies of aero engines as well as stationary gas turbines for power generation. On internally cooled turbine parts temperature gradients of the order of 100 to 150 °C can be achieved. Today, state-of-the-art TBCs, typically consisting of an yttria-stabilised zirconia top coat and a metallic bond coat deposited onto a superalloy substrate, are mainly used to extend lifetime. Further efficiency improvements require TBCs being an integral part of the component which, in turn, requires reliable and predictable TBC performance. Presently, TBCs produced by electron beam physical vapour deposition are favoured for high performance applications. The paper highlights critical R&D needs for advanced TBC systems with a special focus on reduced thermal conductivity and life prediction needs.

Thermal barrier coating applications have been used on thermally loaded combustion process components for decades. In the beginning of turbine technology development, science and industry worked on solutions about how to combine different properties such as those of superalloy metals and ceramic insulators. While partially stabilized zirconia became the standard material very early on, thermal spraying and electron beam physical vapor deposition in the early 1990s were even considered as competing technologies.

Although EB-PVD coatings have a higher thermal conductivity than plasma-sprayed coatings, especially for parts in the HP stage of the turbine, they have a longer life and are statistically more reliable. The major roadblocks for thermal barrier technology on its way to become a fully prime reliant, designed-in feature are the

understanding and modeling of failure mechanisms and consequently to prove the developed lifing-models by testing and ultimately real component performance. Several potential answers for today's technical issues are discussed with respect to their ability to shift TBC applications to the next level of reliability within various engine environments. For example, the inline hardware concept offers a unique combination of conservative, proven process sequence steps with widely improved quality aspects and optimized throughput set-ups.

**Conclusions:**

- These greenhouse gas emissions have increased the greenhouse effect and caused Earth's surface temperature to rise. The primary human activity affecting the amount and rate of climate change is greenhouse gas emissions from the burning of fossil fuels.
- The increased volume of water vapor translates to more frequent and severe precipitation, as well as a larger cloud cover. In addition to water vapor and CFCs, methane, nitrous oxide and carbon dioxide play large roles in fueling global warming. These gases and compounds derive from different sources, including fertilizer runoff, automobiles, agricultural waste and burning fossil fuels.
- It is a good remedy to plant high tolerant plants along the coastal areas to control coastal erosion.
- Recycling the plastic wastage is also a good prevention method to reduce surface temperatures in global warming era.
- To control contaminated water from industrial waste should cultivate tolerant plants like Algae, Azolla for food production.

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