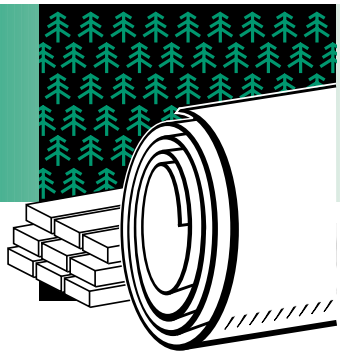
FOREST PRODUCTS

Project Fact Sheet



REPLACEMENT OF THERMALLY PRODUCED CALCINED CLAY

BENEFITS

- Replacement of 225,000 tons of calcined clay with chemically structured composite pigments could save an estimated 2 trillion Btu of energy per year
- Potential to save between $5 and $10 million per year, roughly equivalent to 275,000 to 500,000 barrels of crude oil, through reduced production of calcined clay
- Composite pigments have equal or better performance characteristics than calcined clay
- Offers simplicity of manufacture through total wet processing
- No new capital investment needed for manufacture of composite pigments
- Increases efficiency of titanium dioxide so less of it is required

APPLICATIONS

This new process is applicable in the chemicals and forest products industries for creating paints and paper products that have equal or greater opacity than conventional products yet cost less to manufacture. Potential applications also exist in creating cosmetics, ink, rubber, plastic, and pharmaceutical products.

NEW TECHNOLOGY SAVES ENERGY BY REPLACING CALCINED CLAY USED IN PAPER MANUFACTURING

In the manufacture of paper products, mineral pigments, such as calcined clay, are used as fillers and coatings to increase the quality of the paper's texture, as well as its opacity and receptivity to ink. Often, these mineral pigments are combined with other whitening agents to increase the quality of the product. The paper industry typically uses a mixture of calcined clay and titanium dioxide (TiO_2) to produce high-quality paper. However, this mixture can be costly and is highly energy-intensive to produce. TiO_2 is expensive, even when used in small quantities, and calcined clay production requires a large amount of energy because the clay must be heated to 1000°C for proper drying.

A new invention, funded partially through the Inventions and Innovation Program in the Department of Energy's Office of Industrial Technologies, requires substantially less energy to produce yet creates the same high quality product manufactured through traditional use of the calcined clay and titanium dioxide mix. This new process uses chemical reactions to prepare the clay rather than relying on energy-intensive calcination. In addition, the process requires less titanium dioxide because its distribution within the clay matrix is improved.

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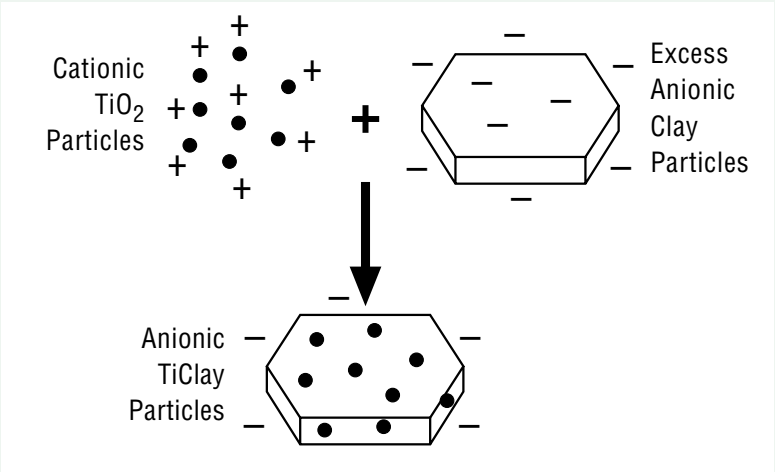

In this new process, cationic (positively charged) TiO_2 particles are added to excess anionic (negatively charged) clay particles to create new particles that will reduce energy consumption and cost during the production of paper products, paint, and other consumer goods.

Project Description

Goal: Develop a process for replacing calcined clay and demonstrate the superiority of this new paper coating process.

The invention includes a process for making a composite pigment for paper and paint products, as well as the composite pigment itself. By mixing positively charged TiO_2 ion particles with negatively charged standard kaolin clay particles, a composite pigment is created that requires less energy and cost than conventional calcined clay. The mixture is manufactured by combining the clay with water and adding positively charged TiO_2. Optionally, a binder may be added. This new process takes advantage of particle charges to create clay that does not require heating, calcination, or dispersion, which require additional energy.

Dr. Michael Whalen-Shaw developed this new technology with the help of a grant funded by the Inventions and Innovation Program in the Department of Energy's Office of Industrial Technologies.

Progress and Milestones

- All work done under the Inventions and Innovation grant has been completed.
- The inventor is seeking additional assistance to complete the project and bring it to commercialization.
- The invention is protected by four U.S. patents.

Economics and Commercial Potential

Commercialization of this invention will require the creation of two markets: one for the process itself among pigment producers and one for the product among those manufacturers that use pigments. However, because this invention offers the opportunity to replace raw material with a substantially more energy- and cost-effective substitute having equal or greater properties than current technology, the commercial potential for the invention appears promising.

Industry of the Future—Forest Products and Agenda 2020

*In November 1994, DOE's Secretary of Energy and the Chairman of the American Forest and Paper Association signed a compact, establishing a research partnership involving the forest products industry and DOE. A key feature of this partnership was a strategic technology plan—**Agenda 2020: A Technology Vision and Research Agenda for America's Forest, Wood and Paper Industry.** Agenda 2020 includes goals for the research partnership and a plan to address the industry's needs in six critical areas:*

- *Energy performance*
- *Environmental performance*
- *Capital effectiveness*
- *Recycling*
- *Sensors and controls*
- *Sustainable forestry*

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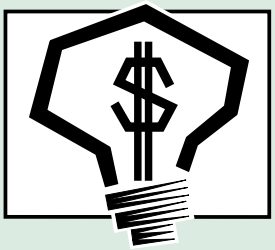

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

Project Partners

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