

Expand into Next-Generation Technology— 1

Next-Generation Friction Materials

Developing Products Free of Environmentally Hazardous Substances

The use of brake friction materials generates brake dust. In North America, regulations on environmentally hazardous substances have been tightened due to anxiety over the impact of brake dust on the ecosystems of rivers and gulfs. In response, Akebono is striving to develop technologies that reduce the volume of brake dust generated from friction materials while extending the product life of brake pads. It is also conducting research to create methods to analyze and evaluate brake dust.

Also, Akebono promotes the development of products with a lower environmentally hazardous substance content. In accordance with in-house guidelines, which set forth stricter regulations on brake raw materials than required by law, Akebono painstakingly examines these materials' possible impact on the environment and work environment from the product design and development stages. We avoid using materials that fall under the category of environmentally hazardous substance and when it is determined that a substance has a significant impact on people and the environment, we use alternative materials.

Development and Promotion of Copper-Free Friction Materials

In the U.S. states of Washington and California, state laws have been enforced regarding restrictions on chemicals contained in automotive brake friction materials to prevent the impact of emissions of such substances on river and marine ecosystems. In the state of California, restrictions on copper will be enforced from 2021, and from 2025 onward, it will be illegal to fit new vehicles with friction materials containing 0.5% or more of copper. Conventional friction materials have used copper to ensure safe and effective performance at high temperature. Akebono developed copper-free friction materials and started to market them for aftermarket products in 2007 and supply them as OEM parts to automakers since 2014. By combining multiple component materials, Akebono achieved the same performance as copper contained pads while keeping the cost at the same level.

Around 80%* of Akebono brand aftermarket brake pads have a copper content that is lower than the 2025 standard for the state of California. Furthermore, we are also working to quickly develop antimony-free materials, as these could potentially be targeted under future regulations.

Akebono will continue to comply steadily with laws, including Washington state laws going forward.



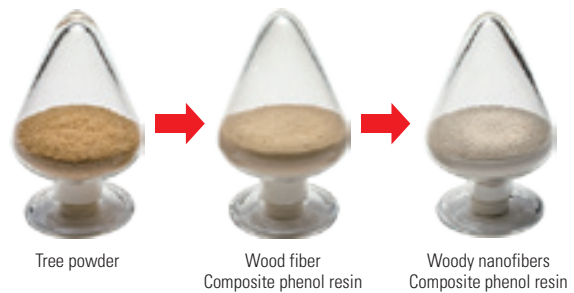
Copper-free brake pad

*Shipment volume basis

Developing Proprietary Materials

The Research & Development Centre develops friction materials that reduce environmental impact. Based on the material technology, the Centre develops new materials which can be applied in new fields other than brakes. Akebono seeks to establish an advantage by differentiating itself from its competitors.

For example, as Akebono's original material, the R&D Centre succeeded in developing phenol resin with wood powder. A special feature of this new material is that fibers miniaturized to nano size based on coniferous wood powder are uniformly dispersed in phenol resin. The new material makes it possible to achieve greater strength in the brake's operating temperature range than with conventional phenol resin. As a result, the new material helps improve the wear resistance of brake pads and improves noise and vibration (NV characteristic).



In addition, Akebono has developed inorganic particles with unique shapes as its new material for new business fields. This material is a uniquely shaped particle that draws fully upon synthetic processes cultivated in material development for brake friction materials and cannot be stably obtained by usual methods. We are working on developing various fields of application by controlling the physical and chemical properties resulting from this unique shape.

