

NON-ASBESTOS FRICTION MATERIALS

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ABSTRACT

Friction materials for automotive brakes are complex composites containing three general types of ingredient materials: reinforcing fibers; modifiers that adjust or maintain friction level, wear rate, and noise properties; and organic resin binders. Historically, the foundation or major constituent of automotive friction materials has been asbestos fiber, so chosen because of thermal stability, friction level, reinforcing properties, availability, and relatively low cost.

Numerous substitutes for asbestos in conventional organic materials have been evaluated, including both naturally occurring and synthetic materials. Direct substitution of these alternative materials in conventional formulations has resulted in poor friction levels, friction instability, roughness, structural failure, increased noise, mating surface deterioration and/or front-to-rear vehicle brake imbalance. Complete reformulation, not simple substitution, is necessary to meet the numerous, complex performance requirements of consumers, manufacturers, and government standards, such as FMVSS 105-75 and FMVSS 121.

In the 1960's, a new class of friction materials, called semimetallics, was developed to meet severe braking requirements, primarily in heavy-duty disc brake and extreme duty truck block applications. Semimetallics operate satisfactorily against the ventilated cast-iron rotors in the smaller brakes of downsized cars, as well as against the solid rotors found in the lighter brakes of new front wheel drive vehicles. Semimetallics rely on steel fiber and powder metallurgy techniques for reinforcement, and do not require asbestos. The improved performance of semimetallics compensates for their higher costs due to more expensive ingredients, higher specific gravity, and more costly processing requirements. Overall development took more than 10 years from introduction to significant customer acceptance.

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