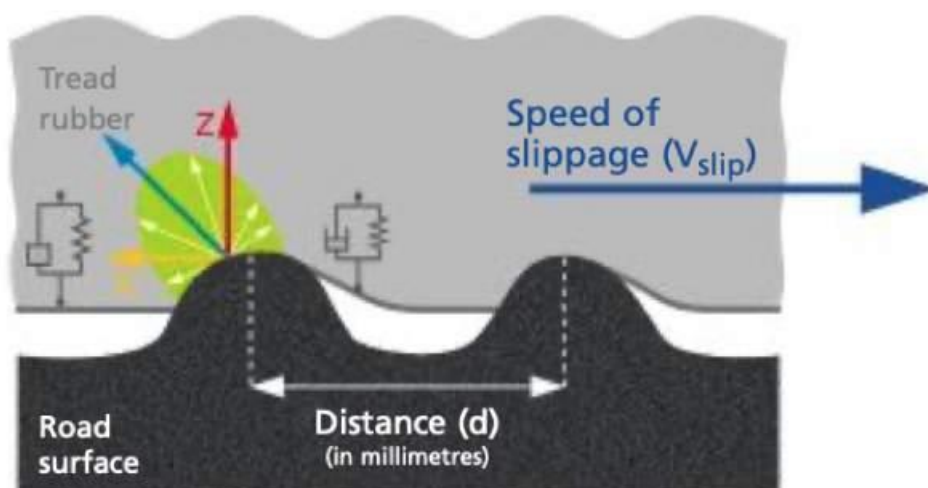


## Rubber and Car Tyres

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A common use for rubber is for tyres on all types of vehicles from cars to trucks and even top-level race cars. Tyres are integral for cars as they are what allow the power from the engine to be exerted onto the road thereby creating a moving motion. The main type of rubber used in car tyres is styrene-butadiene rubber.

Styrene-Butadiene Rubber has a low young modulus of 6MPa thereby allowing it to deform and then recover its shape as fast as it deformed. This is useful in a tyre as the road surface has small holes which when driven over the tyre deforms into these holes increasing the surface area of the contact patch thus increasing grip. The deformation of the tyre creates an elastic energy store which as the tyre returns to its original shape it exerts kinetic energy onto the road providing motion. Styrene-butadiene is elastic and can stretch 565% of its original length before tearing; this means that an extremely high amount of force will be required for the tyre to tear and become unusable.



Rubber is a tacky substance due to its molecular adhesion. The rubber creates bonds with the road surface and as the tyre slides across the molecular chains in the rubber stretch, the rubber resists the deformation of the tyre creating a friction force which opposes the slippage. This stretching and resisting of the tyre creates grip allowing the tyre to stick to the road creating traction, stopping the car from sliding around uncontrollably. Tyres work in wet conditions due their grooved tread and rubber being waterproof not allowing water to affect the shape of the tyre. Because of this, road tyres can be used for all weather conditions.



Molecular adhesion to the road surface as the bond broke from the tyre instead of from the road.

Also, rubber is used in car tyres because it is a strong substance with high resistance to fatigue and abrasion. This is caused by having 565% elongation to tear. This means that the rubber in the tyres will degrade very slowly, so the tyres have a long lifespan. This is an important feature for tyres due to their need to be reliable and dependable so that they are always safe when driving and won't cause a crash if the tyres fail.

Furthermore, the reliability of a tyre is helped by the fact that rubber is quite a hard material with high impact resistance due to the elasticity spreading pressure around the tyre, for example the hardness of styrene-butadiene rubber is 67.5 shore. This is useful in a car tyre as it makes the tyre sturdy and strong. This helps the reliability of the tyre as it is less likely to obtain punctures and damage.

Rubber is also temperature resistant and styrene-butadiene rubber has a melting point of approximately 200°C. The contact between the rubber tyre and the road surface creates friction, thus creating heat. Rubber contracts in heat, however, because of its resistance to heat, the rubber does not contract, and the tyre does not lose its elasticity from the friction, allowing it to keep deforming to the shape of the road.

In conclusion, the unique properties of rubber make it the perfect material for a car tyre. Rubber's resistance to temperature and water as well as its tendency of molecular adhesion and flexibility help to maintain the tyre's shape and grip. The strength of rubber makes tyres more resistant to wear and damage and its low young modulus allows rubber to deform and recover its shape quickly.

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