

SBR Rubber Introduction 1

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Part 1 Brief Introduction

SBR rubber is Styrene-butadiene rubber elastomer whose butadiene and styrene as monomer, copolymer by catalytic copolymerization in the emulsion or solution.

Since 1930 the emergence of high temperature emulsion polymerization styrene butadiene rubber, through continuous improvement and innovation, by around 1947, there is low-temperature copolymerization styrene-butadiene rubber, and then oil filling, carbon black filling, oil & carbon black filling styrenebutadiene rubber appeared one by one. These belong to the general use styrene-butadiene rubber, due to the development of industrial technology, some special purpose varieties rubber, such as styrene-butadiene rubber oil resistant, spindle base styrene butadiene rubber, liquid styrene butadiene rubber, etc are available. Since 1960s, there appeared the soluble poly styrene butadiene rubber. These types of rubber according to different combination of styrene content have different natures. [SBR rubber](#) mainly includes of the following varieties: high temperature copolymerization of styrene butadiene rubber, low temperature copolymerization of styrene butadiene rubber, oil filling styrene-butadiene rubber, carbon black filling styrene-butadiene rubber, oil & carbon black filling styrene-butadiene rubber mixing, soluble poly styrene butadiene rubber, alfin rubber.

Part 2 Basic Properties of SBR Rubber

Styrene butadiene rubber is unsaturated nonpolar rubber of carbon chain, belong to the same category with natural rubber. Therefore, it has the commonness of this kind of rubber, but it also has its own characteristics.

1. Mechanical property

(1) Good elasticity. Although the styrene-butadiene rubber elasticity is lower than the natural rubber, but is still good among all the rubber. Generally speaking, the impact elasticity of SBR Rubber-1500 which containing 50 copies of HAF carbon black, formulated of traditional sulfur vulcanization system is about 55% of natural rubber. This is determined by the molecular flexibility, can be judged according to the glass transition Tg. Tg of SBR rubber is 15°C higher than that of natural rubber, which means the molecular flexibility of SBR rubber is lower than natural rubber. Because of side group on styrene-butadiene rubber molecular chains are the phenyl and vinyl, their molar volume is greater than that of natural rubber whose molecular chain has sid methyl on it. In addition, for the same reason that styrene-butadiene rubber is not easy to rotate in the macromolecular chains, the rotation barrier also increased thus.

Next, the cohesive energy density of styrene-butadiene rubber is a little higher than natural rubber. SBR-1500 is 291.9~309.2 MJ/m³, and the natural rubber is 266.2~291.4 MJ/m³. Therefore, [styrene-butadiene rubber sheet](#) interaction force between molecules is big, binding is subjected by molecular rotation movement is also big.

(2) SBR rubber is reinforcing rubber. Styrene-butadiene rubber is not available

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for crystallization, its tensile strength, tear strength and raw rubber tensile strength of non-reinforcing vulcanized rubber is far lower than the natural rubber.

(3) Wear-resisting properties of styrene-butadiene rubber. Wear-resisting performance of [SBR rubber sheet](#) is superior to natural rubber; butadiene rubber can only show its good abrasion resistance under the condition of rigid pavement compared to the styrene-butadiene rubber. Generally we think the wear resistance of poly styrene butadiene rubber in soluble is less than poly styrene butadiene rubber.

(4) The crack resistance of styrene-butadiene rubber. Styrene-butadiene rubber cracking resistance is superior to natural rubber, but the crack growth is faster than natural rubber; Soluble poly (styrene butadiene rubber pattern groove cracking resistance is better than emulsion poly styrene butadiene rubber.

(5) Wet resistance of styrene-butadiene rubber. The grab force on wet pavement of styrene-butadiene rubber is bigger than butadiene rubber. Rolling resistance of soluble poly styrene butadiene rubber is lower than that of the emulsion poly styrene butadiene rubber, and the catch force on wet pavement is greater than the low temperature emulsion poly styrene butadiene rubber.

(6) Electric properties and solvent resistance of styrene-butadiene rubber. Styrene-butadiene rubber solvent resistance and its electric properties are similar to natural rubber. This is because they are polar diene rubber.

3. Chemical property

[Styrene-butadiene rubber](#) and natural rubber are same unsaturated nonpolar carbon chain rubber, so they have similar chemical reactivity, which can use sulfur vulcanization and ageing resistance, etc. Reactivity of styrene-butadiene rubber is only slightly lower, mainly because the side base of styrene-butadiene rubber molecular chain are weak electron-withdrawing groups, natural rubber side base of molecular chain is pushing electronic group, the former has passivation effect on α -hydrogen, the latter has activation. Secondly, phenyl volume is bigger, may has dragging effect on reaction, double bond concentration of styrene butadiene rubber is lower than natural rubber. So, styrene-butadiene rubber chemical reactivity is slightly lower than natural rubber, which shows it is slightly lower at curing rate, aging resistance better than natural rubber. Upper temperature is about 10~20 °C higher than that of natural rubber.