



# PROPERTIES OF CLAYS IN RUBBER

Imerys offers a large number of clays for the rubber industry. These clays differ principally in particle size going from the finest, **Speswhite™**, with a surface area of 30m<sup>2</sup>g<sup>-1</sup> to **Polwhite™ E** with a surface area of about 7m<sup>2</sup>g<sup>-1</sup>. In rubber the finest give semi-reinforcement and the coarsest moderate reinforcement.

The principle mineral in the clay is kaolinite, a high aspect ratio platy hydrated aluminium silicate, A1<sub>2</sub>O<sub>3</sub>.2SiO<sub>2</sub>.2H<sub>2</sub>O. The mineral is chemically inert to acids, alkalis and organic fluids.

These properties mean that clays offer the compounder the facility to formulate for mechanical performance, chemical resistance and control over fluid permeability.

Clays also have a major influence on most of the processing behaviour of rubber. These influences and properties are summarised in the tables for the most important of the clays supplied by Imerys. When heated to over 1000°C (calcining) the clay loses its water of crystallisation, changes shape and surface chemistry. Calcined clays give interesting different combinations of properties outlined below.

## PROPERTIES OF CLAYS IN RUBBER

	Ultrafine secondary (ball) clay	Fine Kaolin	Less Fine Kaolin	Calcined Kaolin
	Hexafil Hexafort H	Speswhite Stockalite	Polwhite E Devolite	PoleStar 200R Polarite
Cost	Low	Moderate	Low	Moderate
Colour	Off-white	White	White	White
Reinforcement	Semi-reinforcing	Semi-reinforcing	Moderate reinforcement	Moderate reinforcement
Tensile strength	High	High	Moderate	Moderate
Modulus	Moderate	Moderate	Moderate	Moderate
Tear strength	Moderate	Moderate	Moderate	Moderate
Permanent set	High	Moderate	Moderate	Low
Abrasion loss	Moderate	Moderate	High	High
<b>Electrical insulation</b>				
Dry	Moderate	Good	Good	Excellent
Wet	Poor	Poor	Moderate/Poor	Excellent
Chemical resistance	Excellent	Excellent	Excellent	Excellent
Water absorption	High	Moderate	Low	Very low
Gas permeability	Low	Low	Low	Low

PROCESSABILITY OF CLAYS IN RUBBER

	Ultrafine secondary (ball) clay		Fine Kaolin		Less Fine Kaolin		Calcined Kaolin	
	Hexafil	Hexafort H	Speswhite	Stockalite	Polwhite E	Devolite	PoleStar 200R	Polarite
pH	9	5	5	7,5	5	7,5	6,5	-
Surface area (m <sup>2</sup> /gm)	30	30	11	10,5	6,5	5	8,5	-
<b>MIXING</b>								
Dispersability:-								
in dry rubbers	Moderate		Easy		Very Easy		Very Easy	
in water (latex)	Easy	Difficult	Difficult	Very Easy	Difficult	Very Easy	Easy	Dev
Heat build-up	Moderate		Low		Low		Low	
Mill sticking in GP rubbers	Moderate		Low		Low		Very low	
Mill sticking in polychloroprene	High		High		Low		Very low	
Green strength	High		Moderate		Moderate		Moderate	
<b>EXTRUSION</b>								
Die swell	Moderate-low		Moderate-low		Moderate		Moderate-low	
Edge definition	Moderate		Moderate		Moderate		Good	
Surface finish	Moderate		Moderate		Moderate		Excellent	
<b>CURE PROPERTIES</b>								
Compound viscosity	High		Moderate		Low		Moderate	
Cure rate	Moderate		Fast		Fast		Fast	
Accelerator adsorption	High		Moderate		Low		None	
Effect on peroxides	Moderate	High	High	Low	Moderate	Low	None	Dev

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