MIXER COMPOUNDS

Lead Free EPDM Compounds for MV Cables

LEAD FREE

EPDM Compounds for MV Cables

- EPDM based compounds combine superior mechanical and electrical properties
- For these reasons, they are used in a wide variety of voltages and applications, such as

Low, medium and high voltage cables

Control and instrumentation cables

Mining cables

Power cords

Cables accessories

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LEAD FREE

EPDM Compounds for MV Cables

- In EPDM compound the rubber resin is mixed with other additives to improve the mechanical and electrical properties

- Lead oxides are used as additives in today's commercially available EPDM compounds for Medium Voltage (MV) insulations as stabilizers for long lasting performances.

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Currently in the European Union the Red Lead Oxide is listed in Reach SVHC (Substances of Very High Concern) list, forcing MV cable producers to substitute the material with a

LEAD FREE ALTERNATIVE

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R&D

new LEAD FREE product

Mixer is producing MV cable compounds since 1996.

Main features:

- Base polymers: EPR/EPDM.
- Coated and uncoated mineral fillers.
- Peroxide soaking process at low temperature.
- Clean compounding process without contamination.

What's NEW

STABILIZER SYSTEM:

LEAD FREE SYNERGISTIC MIXTURE OF ORGANIC AND INORGANIC ADDITIVES WITH ENHANCED ION SCAVENGING PROPERTIES

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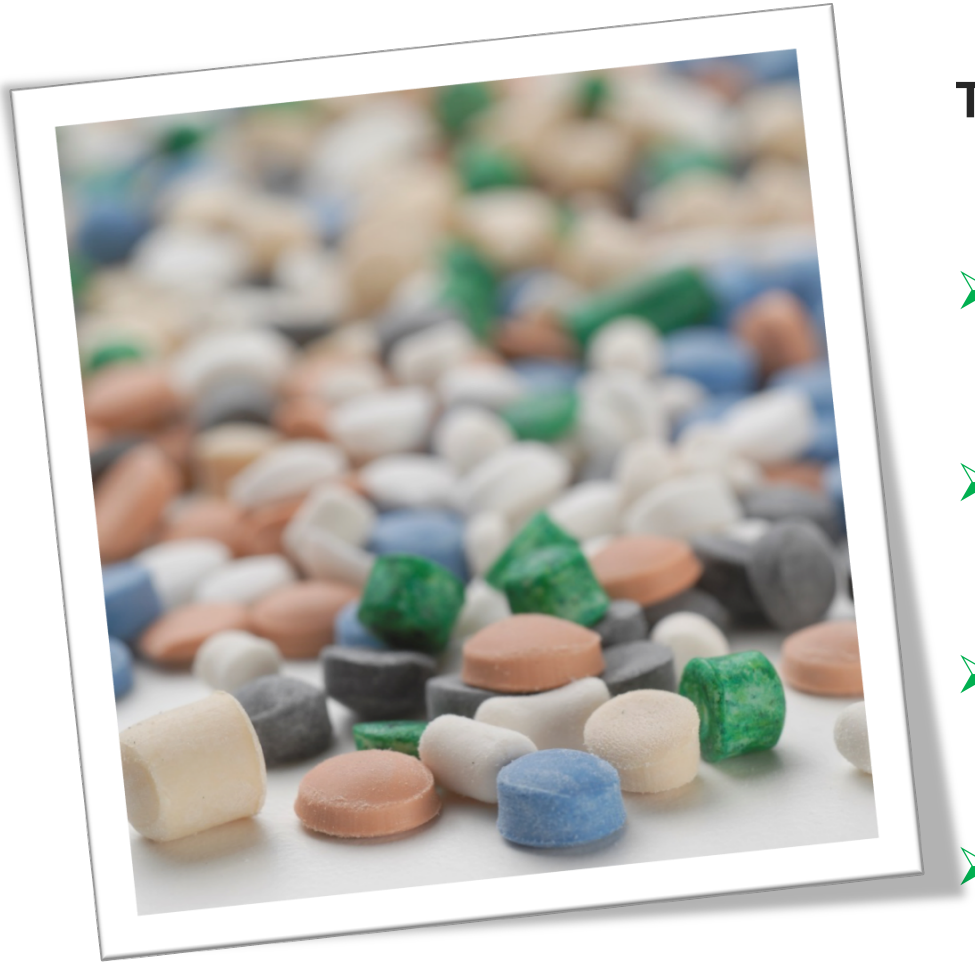
Optimization for the new LEAD FREE product



The following parameters have been taken into consideration:

- Easy dispersion and compatibility of new stabilizers into polyolefin matrix.
- Good electrical properties of new stabilizers, especially in wet conditions.
- No interference between crosslinking system and lead free stabilizing pack.
- Final cost of the compound.

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MECHANICAL PROPERTIES

Lab Simulation

PROPERTIES	UNIT	3IS741 (LEADED)	3IS791 (LEAD FREE)
SPECIFIC GRAVITY	g/cc	1.20	1.18
MECHANICAL PROPERTIES			
MODULUS AT 200%	PSI	1000	1000
TENSILE STRENGTH, MINIMUM	PSI	2000	2000
ELONGATION, MINIMUM	%	430	430
HARDNESS	Shore A	84	84
VISCOSITY MOONEY ML (1+4) 100 °C		46	56
CROSSLINKING TIME T90 @ 180°C	minutes	7′ 26″	7′ 46″

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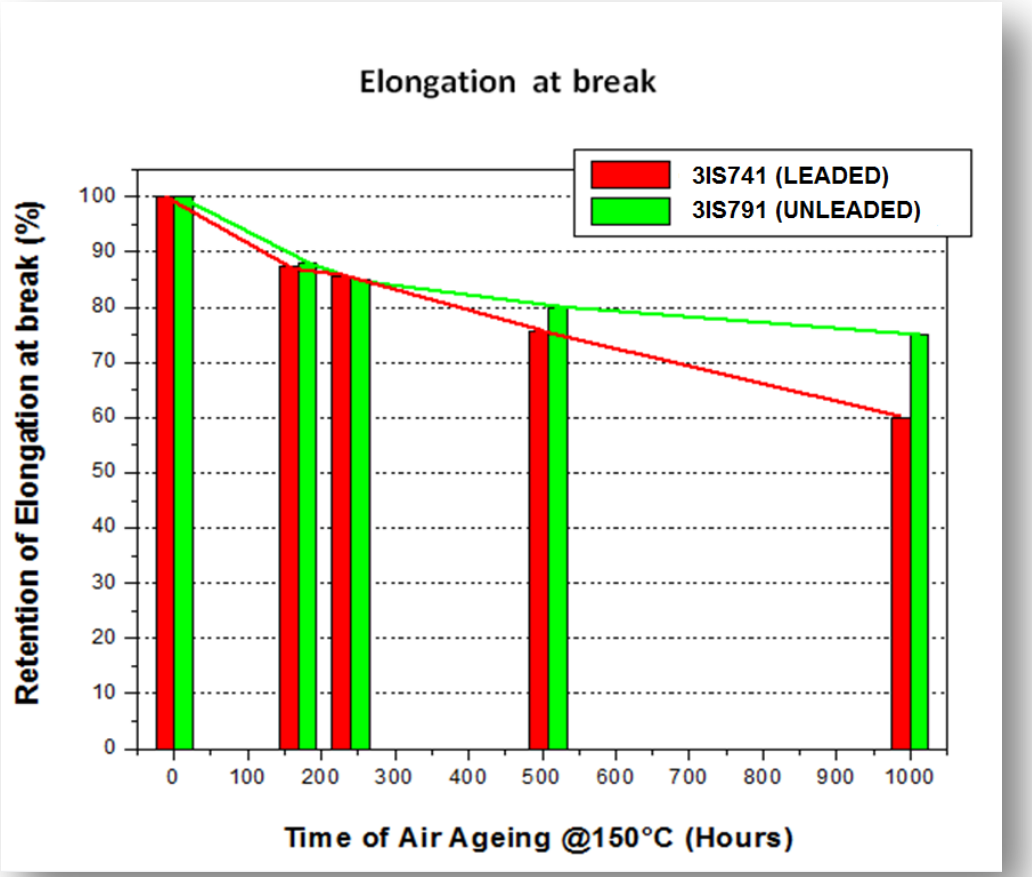
AGEING RESISTANCE

Lab Simulation



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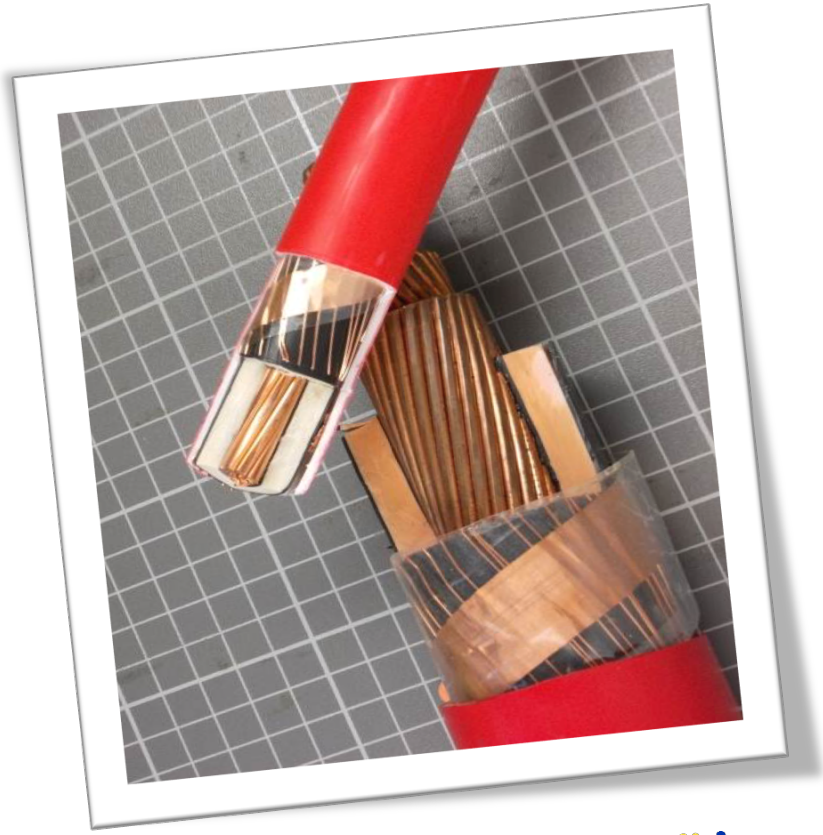
MV POWER 65 KV CABLES

Tests

PROPERTIES	UNIT	REQUIRED BY EU CUSTOMERS	3IS741 (LEADED)	3IS791 (LEAD FREE)
MECHANICAL PROPERTIES				
MODULUS AT 150%	PSI	> 650	1480	1770
TENSILE STRENGTH, MINIMUM	PSI	> 1450	2640	2450
ELONGATION, MINIMUM	%	> 200	410	320
AIR OVEN AGEING (168 H @ 150 °C)				
TENSILE STRENGTH, VARIATION	△	± 30%	-11	+14
ELONGATION, MAXIMUM VARIATION	△	± 30%	-9	-7
AIR OVEN AGEING (504 H @ 150 °C)				
TENSILE STRENGTH, VARIATION	△	± 30%	-21	+18
ELONGATION, MAXIMUM VARIATION	△	± 30%	-22	-15
AIR BOMB AGEING (40 H @ 127 °C)				
TENSILE STRENGTH, VARIATION	△	± 30%	-2	+14
ELONGATION, MAXIMUM VARIATION	△	± 30%	-2	+2

MECHANICAL PROPERTIES

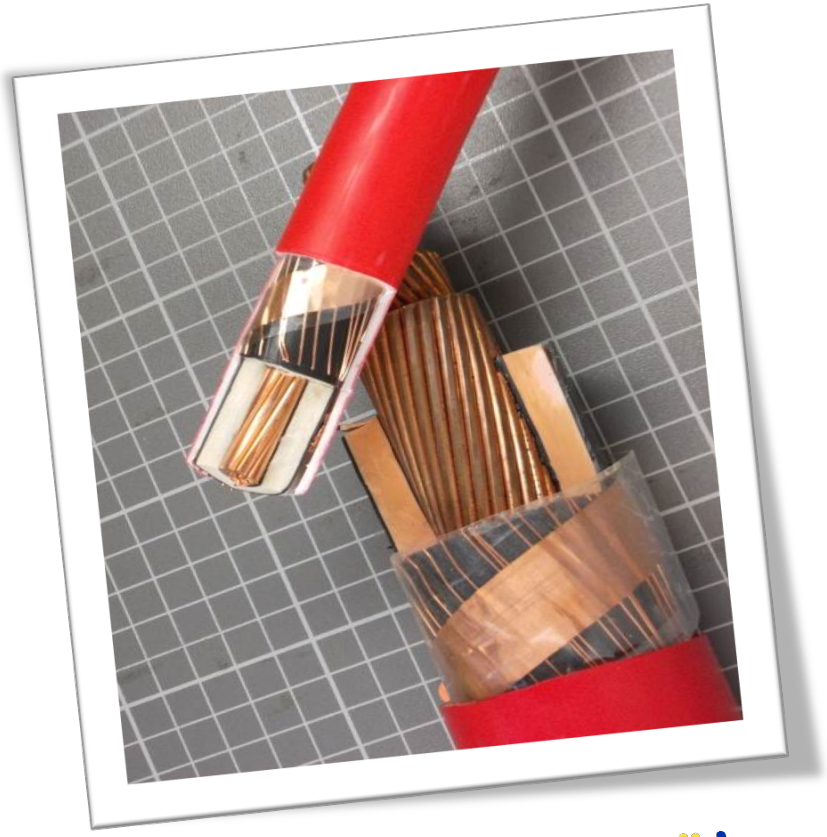


MIXER COMPOUNDS

MV POWER 65 KV CABLES
Tests

ELECTRICAL PROPERTIES

PROPERTIES	UNIT	3IS741 (LEADED)	3IS791 (LEAD FREE)
DIELECTRICAL PROPERTIES			
DIELECTRICAL CONSTANT @ 25 °C (UNAGED)	-	2.57	2.61
DIELECTRICAL CONSTANT @ 25 °C (AFTER AGEING)	-	2.65	2.76
DIELECTRIC LOSS FACTOR TAN δ @ 25 °C/50HZ (UNAGED)	-	$2.4*10^{-3}$	$2.2*10^{-3}$
DIELECTRIC LOSS FACTOR TAN δ @ 25 °C/50HZ (AFTER AGEING)	-	$1.8*10^{-3}$	$2.7*10^{-3}$
INSULATING PROPERTIES			
INSULATION CONSTANT @ 20 °C	MΩKm	6000	8000
INSULATION CONSTANT @ 90 °C	MΩKm	6	7
WATER ABSORBTION TEST (24H @ 100 °C)			
VARIATION OF MASS, MAXIMUM	mg/cm^2	0.09	0.04
DIELECTRIC STRENGTH CABLE 95 MM^2 20/12 KV	kV/mm	30	40



Ageing conditions: Aged 136°C Oven for 7 days and immersed for 2h in 100°C water

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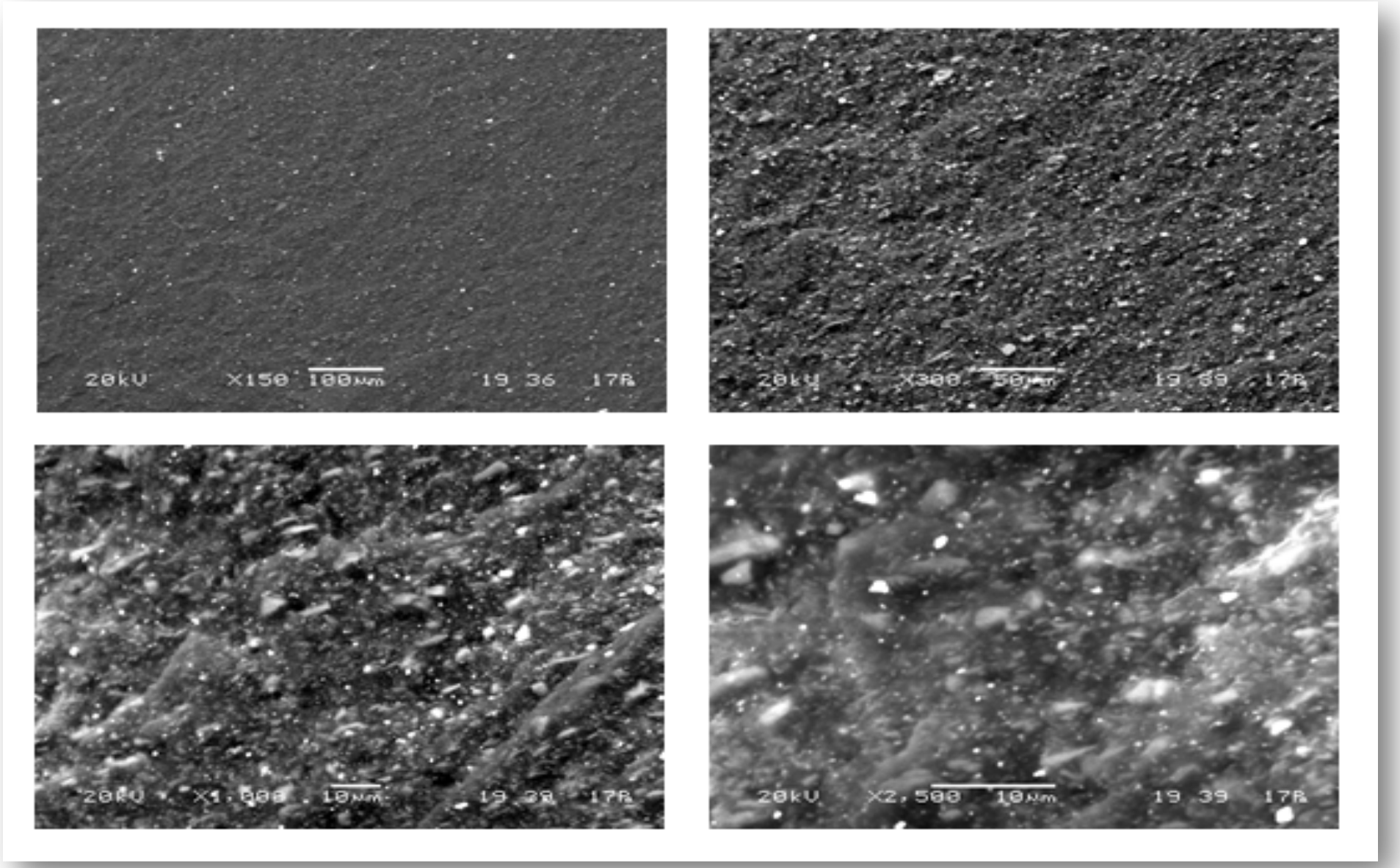
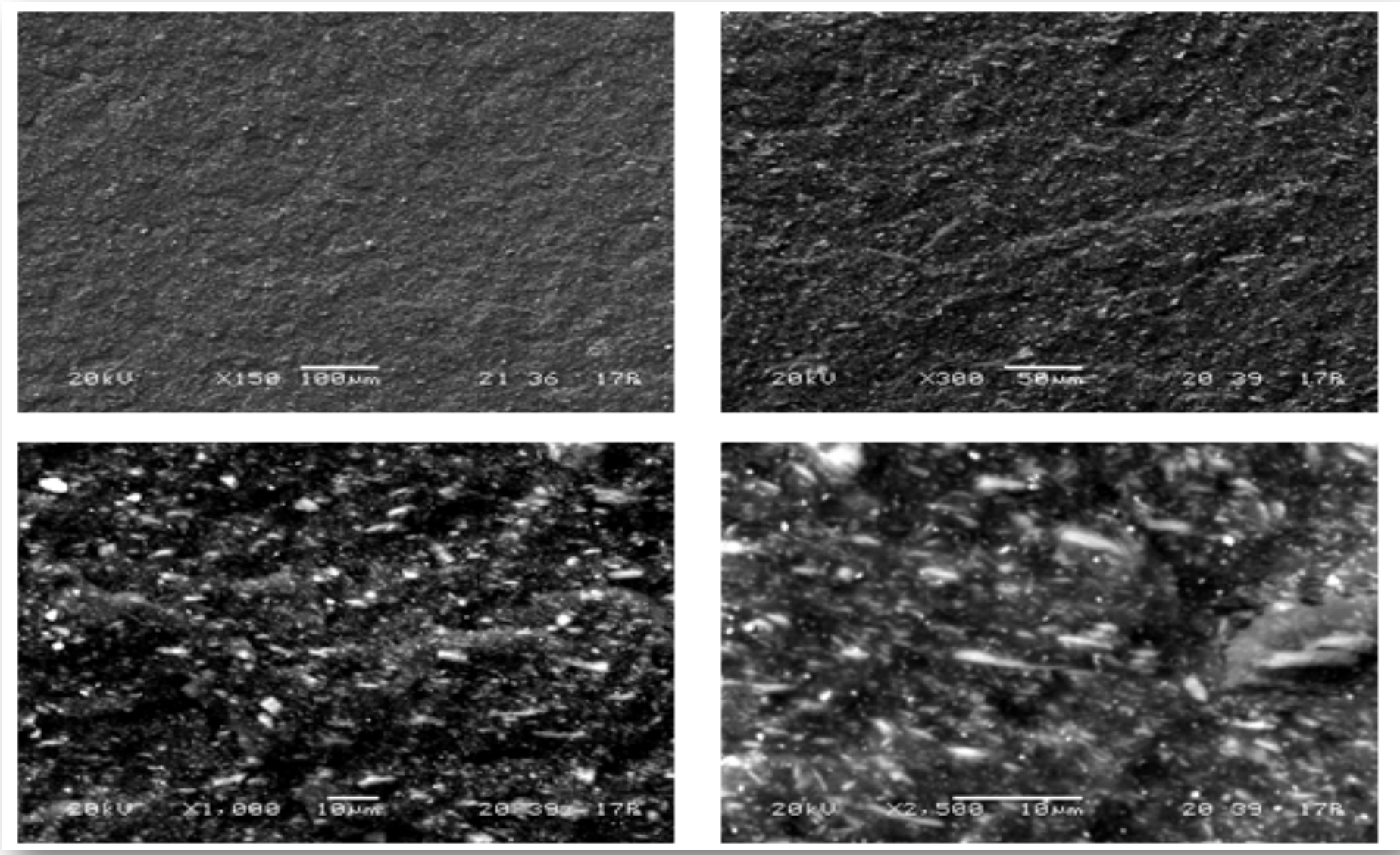


Morphology of MV LEADED compound

MIXER COMPOUNDS



Morphology of MV LEAD FREE compound

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THANK YOU FOR YOUR ATTENTION

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