



LIGHTEN YOUR BATTERY!



TBLs+®



TBLS+® FOR ALL TYPES OF AUTOMOTIVE AND INDUSTRIAL BATTERIES

PENOX GmbH developed tetra-basic lead sulphate (4BS) seeding material (particle size of typically 0.5 micron) enabling the battery manufacturer to produce tetra-basic crystals. TBLS+ allows control of the size of the 4BS crystal and the porosity of the positive active mass. Since TBLS+ is delivered as a slurry it is possible to distribute the seeds very homogeneously within the paste by adding 0.5% up to 2% of the product.

Industrial battery manufacturers are using TBLS+® successfully to increase the initial capacity of the battery without losing any performance in deep cycle tests.

For Advanced Batteries EFB/AGM, TBLS+® can replace expensive advanced carbons in the negative plate to improve high current and dynamic charge acceptance.

ADVANTAGES

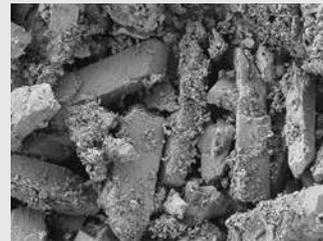
- › Formation of a porous PAM structure during charging operations to support acid exchange and battery operation
- › Formation of smaller lead sulphate crystal structures during discharge operations
- › Increase in service life due to stable crystalline structures during discharge/charge operations
- › TBLS+® reduces water consumption
- › TBLS+® is supplied as a slurry which supports the homogenous distribution of the seeds in the paste

SIGNIFICANT PERFORMANCE IMPROVEMENT OF LAB

Tetrabasic (4-basic) lead sulphate

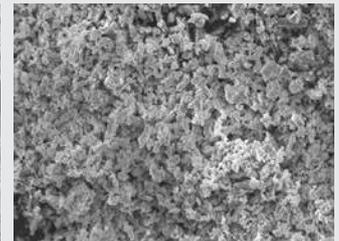
- › Gives more stable capacity C20 in discharge and recharge applications
- › Limits passivation after deep discharge (Sb free effect)
- › Improves cycling performance under partial state of charge
- › Avoids softening of the active material in lifetime tests (hot cycling tests at 60 °C and more)
 - › **Longer lifetime batteries**
 - › **Less variation for battery performance during lifetime**

WHY TETRA BASIC WITH TBLS+®?



without TBLS+®

— 10 µm



with 1% TBLS+®

— 10 µm

SAVE MONEY – INCREASE PERFORMANCE

AUTOMOTIVE AND INDUSTRIAL:

- › Curing/drying – time savings
- › Formation – time and energy savings
- › Increase of cycle life performance

AUTOMOTIVE:

- › With 1% TBLS+® and battery redesign, total savings of up to 10%
- › TBLS+® balances the battery "electrical system", improves NAM performance

COMPOSITION

TBLS+® is a tetra basic lead sulphate produced by the reaction of lead oxide with sulphuric acid, chemical formula PbSO₄, 4 PbO.

TBLS+® has a very small particle size and is specially treated for applications in the battery industry (lead accumulator). The product is supplied as a slurry, suspended in water.

The minimum content of tetrabasic seed crystals in the slurry is 32%. A special additive avoids the formation of agglomerates in the slurry and increases the shelf life of the material.

HOW MUCH TBLS+®? ¹⁾

- › **SLI batteries for standard/flooded applications:**
0.8 to 1 % TBLS+® results in a 4 basic PbSO₄ crystal 10 -12 µm
- › **AGM / Gel / EFB batteries:**
1 to 1.5 % TBLS+® results in a 4 basic PbSO₄ crystal <10 µm
- › **Batteries for deep cycling applications:**
0.3 to 0.8% TBLS+® results in 4 basic PbSO₄ crystals <20 µm

¹⁾ The final crystal size is also dependent upon the acid:oxide ratio in the paste mix

TECHNICAL DATA

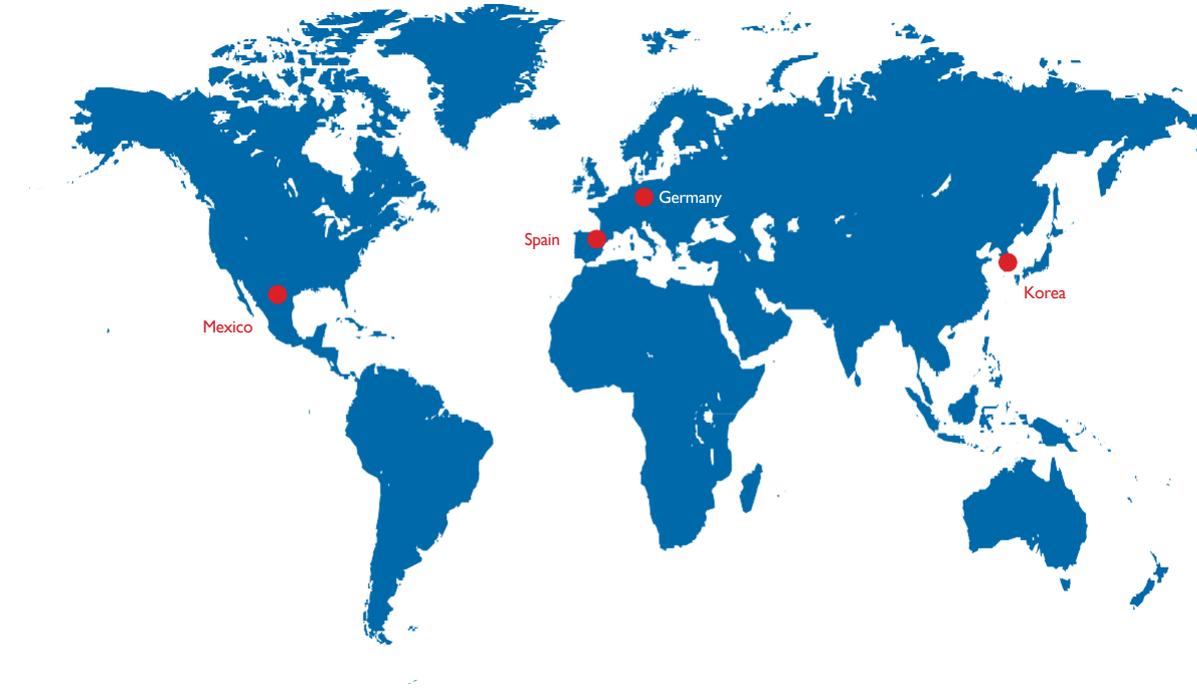
Solids	content	%	39 -45	DIN ISO 787-2
Particle Size	d99	µm	< 5	PV109, Laser Diffraction
	d50	µm	< 1	PV109, Laser Diffraction
Density of the slurry ¹⁾	type	g/cm ³	1.45-1.75	DIN EN ISO 787-10
Content of seeds ²⁾	content	%	> 32	PV261, FTIR Spectroscopy
Pb (total) of the lead compound	content	%	83 -85	PV265, EDTA Titration
Iron	max.	%	0.002	PV 450, ICP

TBLS+® is free of carbon compounds and other components that can affect the battery.

¹⁾ depends on the content of tetra basic seed crystals of the raw material

²⁾ Adjust by the producer

PENOX EXPERTISE ALL AROUND THE WORLD



For more information on our products and services for the battery producer, please visit our updated website:

www.penoxgroup.com

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