NAATBatt 2019

Arkema Battery Solutions

Jason Pomante
North American Market Manager

March 2019
20,000 talents
11,000 in Europe
4,000 in North America
5,000 in Asia and RoW

> 10,000 customers
Collaborations with the largest global brands

WOMEN AND MEN AT THE HEART OF OUR DEVELOPMENT

1,800 new hires every year

€8.3 bn sales
Presence in 55 countries

136 plants
13 R&D centers
BATTERY SOLUTIONS FOR LITHIUM ION BATTERIES
INTEGRATED FROM THE MINE TO POLYMERIZATION

PELLETS

POWDER

LATEX

#1 PRODUCER OF PVDF SINCE 1963

ARKEMA

INNOVATIVE CHEMISTRY
KYNAR ROLES IN THE LIB
FOCUS ON BINDERS
KYNAR® PVDF SOLUTIONS FOR CATHODE

**HSV900**
- Super high Mw Kynar® PVDF
- Good Adhesion
- Stable slurry behavior
- Low internal resistance
- Market reference for LCO, LFP and NMC111

**HSV1800**
- Functionalized Kynar® PVDF
- Designed for Ni+ NMC, LTO and LFP
- Enhanced adhesion
- Fast dissolution in NMP

**HSV1810**
- Functionalized Kynar® PVDF
- Designed for Ni+ NMC/LFP
- Enhanced adhesion
- Fast dissolution in NMP
- Wider processing window in Ni+ NMC
Wider processing window of Kynar® HSV1810 vs HSV1800

Lab scale slurry flowability

Scale-up slurry flowability

Kynar® HSV1810 grade has a better slurry flowability than Kynar® HSV1800 grade.
KYNAR® HSV1810 – Electrode Resistance & Swelling

**Average Electrode Resistance**

![Graph showing average electrode resistance comparison between HSV1810 and Comp.1]

**Electrodes swelling**

![Graph showing volume change vs. soaking days]

**Kynar® HSV1810 grade exhibits lower resistivity and swelling than competitor.**
KYNAR® HSV1810 - ELECTRODE FLEXIBILITY

NMC622/CB/PVDF 97/1.5/1.5

Kynar® HSV 1810

Before Soaking 1 Day Soaking 4 Days Soaking

Smooth

Competition

EC: DEC: DMC=1:1:1

Cracking
Cycling Performance (1C, 45°C) – Pouch Cell

NMC622/Carbon/Binder=96/2/2
FOCUS ON ELECTROLYTE SALTS
DEVELOPING HIGH PURITY SALTS FOR HIGH PERFORMANCE

Main salt for:
- Power performance
- High electrochemical stability (5V)
- Low temperature performance

As main salt for:
- LiFSI
- LiPF6
- LiTFSI
- LiClO4
- LiBF4

Additive to improve lifetime
- LiTDI

As an additive to improve:
- SEI stability
- Al passivation
- Water and Acid scavenger

Salts in EC/EMC 3/7 in volume +10% in conductivity
Industry knowledge and unique emulsion process allows enhancement of binder and separator coating materials

- Enhanced binders HSV-900, HSV-1800 and new HSV-1810
- Wide range of copolymer composition
- Leading supplier in separator coating

Technology development from concept to commercialization resides in USA at the Global Battery Innovation Center

New Technology Programs include:

- Waterborne technologies
  1. PVDF Anode
  2. PVDF cathode
  3. Separator coating
- Alternative electrolyte salts
Thank you – Download our slides!

Jason Pomante  
North American Market Manager  
610-205-7407  
Jason.pomante@arkema.com

Alexis GESLIN  
Business Development Engineer  
484-688-3888  
Alexis.geslin@arkema.com

go.arkema.com/naatBat19

Arkema Inc.  
900 First Avenue  
King of Prussia, PA 19406
Arkema strictly prohibits the use of any polymers, including medical grades, in applications that are implanted in the body or in contact with bodily fluids or tissues for greater than 30 days. Unless Arkema otherwise expressly agrees by written contract, the Arkema trademarks and the Arkema name shall not be used in conjunction with customers’ medical devices, including without limitation, permanent or temporary implantable devices, and customers shall not represent to anyone else, that Arkema allows, endorses or permits the use of Arkema products in such medical devices. Further, all implantable medical devices, whether permanent or temporary, carry a risk of adverse consequences. With regard to implantable medical devices, you should not rely upon the judgment of Arkema. Any decision regarding the appropriateness of a particular medical device in a particular medical application or for a specific clinical use should be based upon the judgment of your physician, medical device supplier and the United States Food & Drug Administration and/or the European process of Medical Device notification. Unless otherwise specifically stated by Arkema in writing, Arkema does not perform clinical medical studies on implantable medical devices. Arkema cannot weigh the benefits against the risks of a device and does not offer a medical judgment on the safety or efficacy of use of any Arkema product in a medical device.

The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. Since the conditions and methods of use of the product and of the information referred to herein are beyond our control, ARKEMA expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information; NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE GOODS DESCRIBED OR THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable when such product is used in combination with other materials or in any process. The user should thoroughly test any application before commercialization. Nothing contained herein constitutes a license to practice under any patent and it should not be construed as an inducement to infringe any patent and the user is advised to take appropriate steps to be sure that any proposed use of the product will not result in patent infringement.