

MATERIAL SAFETY DATA SHEET

JH3 Lithium-Ion Polymer Battery

LG CHEMICAL LIMITED

History

Document No.	MSDS-Cell-JH3			
Revision	MM-DD-YY	Writer	Content	Remark
1.0	15-12-07	Wonseok Chang	Establishment	

1. Identification of the Substance/Preparation and of the Company/Undertaking

Product Name

LGCHEM JH3 Lithium-Ion Polymer Battery

Manufacturer

LG Chemical Limited
Twin Tower
Youido-Dong, Youngdeungpo-Ku
Seoul, Korea

Emergency Telephone Number

+82-2-3773-6570

2. Hazards Identification

Primary routes of entry

Skin contact	:	NO
Skin absorption	:	NO
Eye contact	:	NO
Inhalation	:	NO
Ingestion	:	NO

Symptoms of exposure

Skin contact

No effect under routine handling and use.

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Skin absorption

No effect under routine handling and use.

Eye contact

No effect under routine handling and use.

Inhalation

No effect under routine handling and use.

Reported as carcinogen

Not applicable

Emergency Overview

May explode in a fire, which could release hydrogen fluoride gas.

Use extinguishing media suitable for materials burning in fire.

3. Composition/Information on Ingredients

Hazardous Ingredients	%	CAS Number
Aluminum Foil	2-10	7429-90-5
Metal Oxide (proprietary)	20-50	
Polyvinylidene Fluoride (PVDF)	<5	24937-79-9
Copper Foil	5-20	7440-50-8
Carbon (proprietary)	10-20	7440-44-0
Electrolyte (proprietary)	10-20	
Aluminum, Copper plate and inert materials	Remainder	N/A

Lithium-equivalent Content: 18.56g (233 Wh)

4. First Aid Measures

Inhalation

Not a health hazard.

Eye contact

Not a health hazard.

Skin contact

Not a health hazard.

Ingestion

If swallowed, obtain medical attention immediately.

IF EXPOSURE TO INTERNAL MATERIALS WITHIN CELL DUE TO DAMAGED OUTER CASING, THE FOLLOWING ACTIONS ARE RECOMMENDED ;

Inhalation

Leave area immediately and seek medical attention.

Eye contact

Rinse eyes with water for 15 minutes and seek medical attention.

Skin contact

Wash area thoroughly with soap and water and seek medical attention.

Ingestion

Drink milk/water and induce vomiting; seek medical attention.

For a Better Life

LIFE'S GOOD

WITH

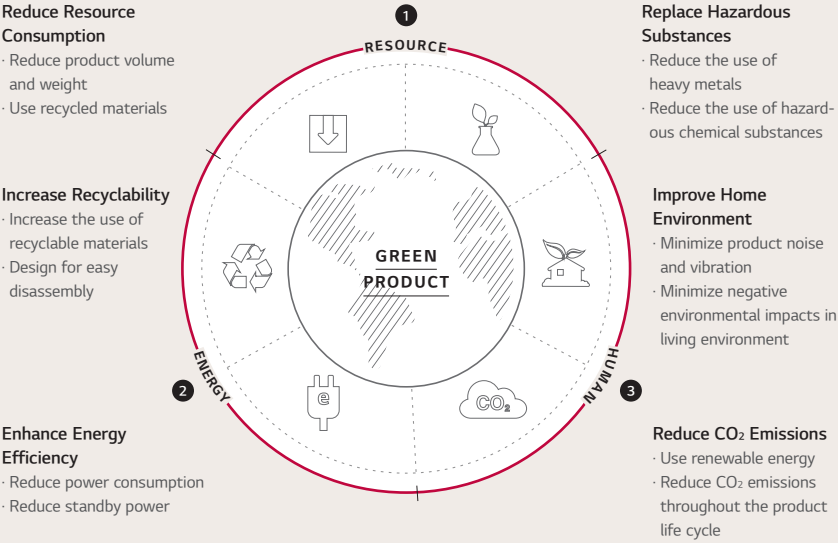
"Life's Good with LG" is the
official CSR slogan of LG Electronics
and conveys our earnest desire for
comprehensive communication
with stakeholders about our
CSR efforts in a variety of areas.

LG

2016-2017 LG Electronics Sustainability Report



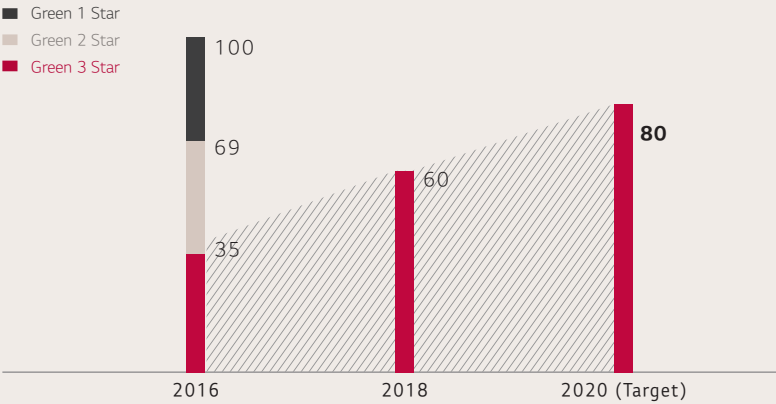
Strategy for Products with Greener Features



Rating Requirements for Eco Index

Core Assessment Criteria			
Category	Green 1 Star ->	Green 2 Star ->	Green 3 Star ->
Energy	Satisfies energy standards	Satisfies market standards on energy efficiency	Achieves competitive advantage (high efficiency)
Human	Complies with regulations on hazardous materials	Replaces hazardous substances voluntarily and proactively	
Resource	Complies with regulations on recycling	Offers design features for efficient resource use	
Innovation	-	Leads the market in terms of greener features	

2016 Performance in Products with Greener Features & Mid- to Long-Term Targets (Unit: %)



continue to develop and expand products with greener features that address customer needs by carefully assessing and managing the environmental performance of our products with the Eco Index.

Life Cycle Assessment (LCA) for Products

Since 2002, LG Electronic has used Life Cycle Assessment (LCA) to accurately quantify and manage the environmental impact associated with the life cycle of our products. In compliance with international standards (ISO 14040 series) for environmental performance assessment tools, the LCA is a technique used to measure the environmental impact associated with all the stages of a product's life cycle, identify improvement, and it is used primarily in the development of eco-friendly products. As part of our efforts to firmly establish our product assessment process based on the LCA, we created the Life Cycle Inventory (LCI) database for core product categories in 2011, with which we perform life cycle assessment on seven product categories (TV, monitor, washing machine, refrigerator, mobile phone, and residential/commercial air conditioning system) on an annual basis. We also assess the global warming impact and the life cycle carbon footprint of our products and disclose the data through our corporate website and sustainability report, while ascertaining the integrity of the information through third-party certifications such as the Carbon Footprint Label, the Low Carbon Certificate, the Carbon Neutral Certificate (Korea), and the Carbon Trust Product Footprint Label (Europe). In 2016, the ecodesign of our Styler Cloth Caring System acquired the Carbon Trust Product Footprint Label (U.K.) and the TUV Green Product Mark (Germany), finally, LCIE^① which is the most prominent non-profit assessment agency in France has verified the Styler as an official 'Eco-Design' product. We also acquired the Green Technology Product Certification awarded by the Ministry of Trade, Industry and Energy of Korea, and are work-

^① LCIE (Laboratoire Central des Industries Electriques, The Central Laboratory of Electrical Industries of France): LCIE's Ecodesign certification is given to a product that has substantially lowered its environmental impact from the previous model through a comparative life cycle assessment of factors that create environmental impacts, such as energy consumption, use of resources, and hazardous content.

Product Carbon Footprint Assessment, Breakdown by Life Cycle Phase (Unit: %)

Category	Pre-Production	Production	Transport	Product Use	Disposal
TV	12.59	0.05	1.40	84.94	1.01
Monitor	7.49	0.03	0.54	90.95	0.99
Washing Machine	37.50	0.29	1.14	57.06	4.02
Refrigerator	20.33	0.19	1.29	77.88	0.31
Commercial Air Conditioner	4.46	0.37	0.25	78.22	16.71
Residential Air Conditioner	0.56	0.02	0.03	95.14	4.25
Mobile Phone	26.23	0.01	6.50	66.83	0.43

ing to expand the "green" technology to other products such as laptops, monitors and ovens. Taking advantage of our experience in the LCA and accumulated data, LG Electronics developed the Simplified LCA tools to assess the potential environmental impact of our mobile phone, TV and home appliance products in the planning phase, and incorporate the results into the development of eco-friendly products.

Product Stewardship

Voluntary Replacement of Hazardous Substances

As a global corporation, LG Electronics is keenly aware of our responsibility for the health of people and the environment and fully complies with international environmental regulations, including RoHS and REACH, strictly prohibiting the use of regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE)) in our products. Moreover, we are proactively replacing other substances that are hazardous to the human body. For instance, we are continuously developing alternative technologies and components to replace or reduce the use of substances that are not currently regulated but believed to be hazardous to the human body and the ecosystem, such as polyvinyl chloride (PVC) and brominated flame retardants (BFRs). As a result of our ongoing efforts, we were able to remove PVC and BFRs from all of our mobile phone products in 2010, followed by phthalate and beryllium in 2011 and antimony trioxide in 2012. PVC cables in our UHD and

OLED TV products have been substituted with PVC-free materials. We also introduced laptop free of PVC and BFRs, while implementing a PVC-free skirt lower to all of our refrigerator products in 2013. Our primary focus in R&D efforts is to replace hazardous or potentially hazardous substances in our products and components while maintaining the highest level of quality, and expand the practice to as many products as possible. In 2015, we also replaced HBCD (Hexabromocyclododecane), a type of brominated flame retardant, from all of our products and packing materials, as part of our preemptive response to the EU's POPs (persistent organic

focus

Performance in Replacing Hazardous Substances



01 - Smart Phone, Smart Watch, G-pad

- Removed PVC and BFRs from all models (2010)
- Removed phthalate and beryllium from all models (2011)
- Removed antimony trioxide from all models (2012)



02 - OLED/UHD TV

- Adopted PVC-free cables
- Adopted mercury-free display panel



03 - Laptop

- Introduced PVC/BFR-free models in 2013 (except for FPCB, Bare PCB, battery, adapter, keyboard, cable, touch pad, thermal module, cable connector, and power cord)



04 - Monitor

- Adopted PVC-free LCD modules for all models (2011)
- Adopted PVC- and BFR-free LCD modules for all models (2013)

Client Name	InJung Kim
Client Company	Cell Development Team.ESS, LG Chem, Ltd.
Application	Requested by Client
Sample Name/Description	JH3
Sample Received	January 22, 2016
Testing Date	January 26, 2016 ~ January 27, 2016
Testing Environment	Temperature : (24 ± 1) °C, Humidity : (39 ± 3) % R.H.
Reporting Date	JAN. 28, 2016
Testing method	Please see the following page(s).
Results	Please see the following page(s).

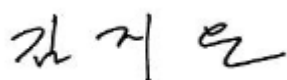
1. The results shown in this report refer only to the sample with which the client provided. The sample name is referred as client assigned.
2. This report cannot be duplicated or utilized without prior permission.
3. This report can be reissued after approval by technical manager and director of analytical center.

Tested by



Rayoung Hwang / Analyst

Authorized by



Jieun Kim / Vice-Technical Manager

The Laboratory Recognized by



Product Service

*LG Chem, Ltd. Research Park is entitled to use the logo on its analytical test reports for the recognized test scopes as long as ACT certificate is valid based on IEC/ISO 17025. Since April 26, 2007

Result(s)

Sample Description : JH3

Heavy Metals

Unit : mg/kg

Test Items	Results	MDL	Test Method
Pb	ND	5	ICP/OES, IEC 62321-5:2013
Cd	ND	2	
Cr ⁶⁺	ND	2	UV-Vis Spectrometer, IEC 62321:2008
Hg	ND	1	TD(G)-AAS, IEC 62321-4:2013

Flame Retardants-PBBs/PBDEs

Unit : mg/kg

Test Items	Results	MDL	Test Method
Monobromobiphenyl	ND	5	GC/MS, IEC 62321:2008
Dibromobiphenyl	ND	5	
Tribromobiphenyl	ND	5	
Tetrabromobiphenyl	ND	5	
Pentabromobiphenyl	ND	5	
Hexabromobiphenyl	ND	5	
Heptabromobiphenyl	ND	5	
Octabromobiphenyl	ND	5	
Nonabromobiphenyl	ND	5	
Decabromobiphenyl	ND	5	
Monobromodiphenyl ether	ND	5	
Dibromodiphenyl ether	ND	5	
Tribromodiphenyl ether	ND	5	
Tetrabromodiphenyl ether	ND	5	
Pentabromodiphenyl ether	ND	5	
Hexabromodiphenyl ether	ND	5	
Heptabromodiphenyl ether	ND	5	
Octabromodiphenyl ether	ND	5	
Nonabromodiphenyl ether	ND	5	
Decabromodiphenyl ether	ND	5	

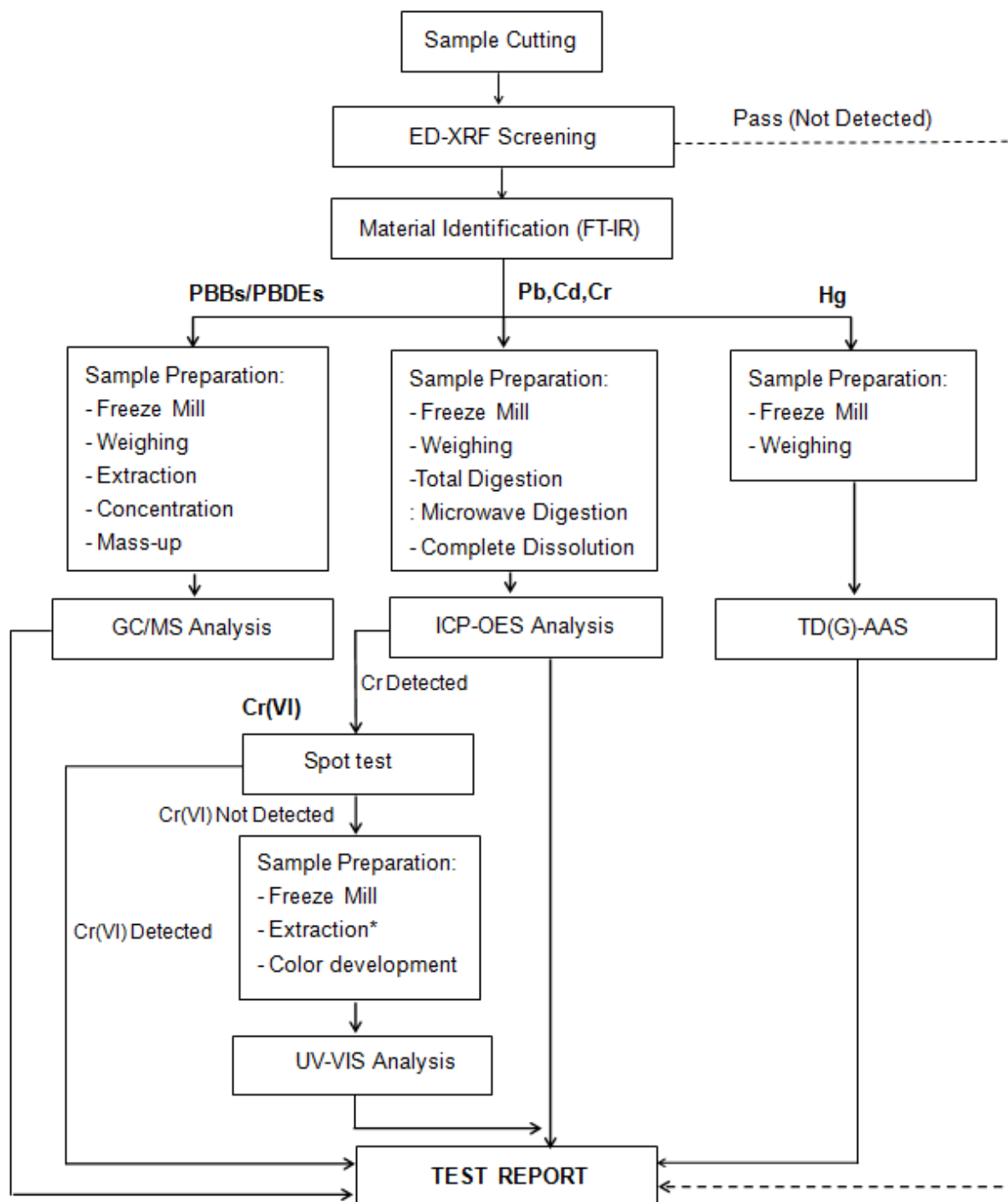
* ND : Not Detected

* MDL : Method Detection Limit

Picture of Sample as Received :




The Test Procedures (RoHS)



* (1) For non-metallic material, add alkaline digestion reagent

(2) For metallic material, add pure water and heat to boiling

-End of Report

							
Division Number		Gulf State Park Interpretive Center					
263100.2		LBC Product Data Reporting Form					
Product Manufacturer:		LG Chem					
Product Name/Number:		RESU10H 400V Battery					
Manufacturer Contact		Linh Tran					
Name:		ltran@lgchem.com					
Email:							
Phone Number:							
% Recyclable:		0					
Recycled Content:		% Post:	0	%Pre:		(PVB)	
Point of Raw Material Extraction (city, state, country if outside of US):							
Manufacturer/Final Point of Assembly (city, state, country if outside of US):		Seoul, South Korea					
Place of Purchase (city, state, country if outside of US):		San Luis Obispo, CA					
Product Hard Cost:		9,890.00					
Ingredients/Components							
This list includes any components of a product and must add to 100%. e.g. A light fixture would have steel housing, acrylic lens, electrical components (RoHS), etc. A table may have FSC certified wood, metal screws, etc. A sealant may have some different chemicals that you must break down here.							
	Component/Ingredient	Material % (must add to 100%)	RoHS	Part Number	CAS Number		
Example	Steel housing	40%	NA	G12 A FL UNV	65997-19-5		
Example	Electrical components	10%	Yes				
Component 1	LG Chem RESU10H		Yes				
Component 2	LG Chem Battery Ingredients:						
Component 3	Aluminum Foil	3.0%					
Component 4	Metal Oxide (proprietary)	40.0%					
Component 5	Polyvinylidene Fluoride	3.0%					
Component 6	Copper Foil	15.0%					
Component 7	Carbon (proprietary)	15.0%					
Component 8	Electrolyte (proprietary)	15.0%					
Component 9	Inert Materials	5%					
Component 10	Misc. Hardware	1%					
Component 11	Lead	3%					
	Total (must add to 100%)	100%					
Does your product contain any Red List items (Tab 3)?			No				
Certified Wood %:			N/A				
Chain of Custody (for product and millworker):							
Is your product wet applied in the field Y/N?				N			
If yes, does product meet SCAQMD 1168 or CARB 2007 SCM (VOCs)?							
If no, does your product contain any solvents on Tab 2?							
Is your product CDPH compliant (Method V1.1-2010 or equivalent)?							
(See Tab 4 & attach documentation)							
Applies to paints & coatings, adhesives & sealants, flooring, furniture, insulation, ceiling systems, ceramic tile, wall coverings, wood paneling.							
Compliant certifications: Green Label, Green Label Plus, SCS Indoor Advantage Gold, FloorScore, Collaborative for High Performance Schools (CHPS), Procedures and □							
Standards for Product Inclusion Version, NSF 332, UL Greenguard Gold, UL 2818 and UL 2821							
Is your product salvaged or made from salvaged materials?				No			
Product Certifications:							
<input type="checkbox"/> Declare Label		<input checked="" type="checkbox"/> Other		RoHS			
<input type="checkbox"/> FPD							
<input type="checkbox"/> HPI							
<input type="checkbox"/> Cradle to Cradle							
Additional Product Notes:							
<i>To be filled out by project team:</i>							
<input type="checkbox"/> Exception							
Notes:							