



Alliance for Batteries Technology, Training and Skills

2019-2023

Battery Material Engineer



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Erasmus+ Programme
of the European Union



Battery Material Engineer

A battery material engineer is responsible for researching, developing and optimizing materials used in batteries. They work with a team of engineers and scientists to design new materials and improve existing materials to increase the performance, safety and cost-effectiveness of batteries. They need to have a strong understanding of materials science, chemistry and electrochemistry, as well as experience with characterization techniques such as SEM, XRD, and electrochemical testing. They also need to have knowledge of battery manufacturing processes and safety protocols. They play a crucial role in developing materials for advanced batteries such as lithium-ion, lithium-sulfur, and solid-state batteries. They also need to be familiar with the regulations and standards related to battery materials and safety.

ESCO Occupations - [ESCO - Occupations - European Commission \(europa.eu\)](https://ec.europa.eu/esco/)

ID	NAME	Concept URI
2149.11	materials engineer	http://data.europa.eu/esco/occupation/4a375b68-88a0-4e5f-99ce-9b01341dfb81

Context

Minimum EQF	6/7/8
Value Chain	Raw Materials and Processing
Departments	Production and Maintenance RnD
Specialisations	Cathode Engineer Anode Engineer Electrolyte Engineer

Cross-sectoral Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Inspect quality	S	- Validation of battery materials	Practitioner	inspect quality of product
Analysis methods	K	- use analysis methods such as root cause analysis - plan and execute root cause analysis - Design Failure Mode and Effect Analysis (DFMEA)	Expert	
Conformity to specification	S	- assure customer requirements for specific applications of materials	Practitioner	ensure conformity to specifications
Process improvement	S	- evaluate and improve running processes - to identify and implement improvements to production processes in the battery industry through root cause analysis and the application of engineering principles.	Expert	ensure conformity to specifications
Manufacturing methods and procedures	K	- design and lead manufacturing engineering methods and procedures of battery materials	Expert	manufacturing processes
Optimization	S	- optimize formulation of materials, such as electrolyte - optimisation of material characteristics	Expert	optimise production
Data analysis	K	- use tools for data analysis	Practitioner	gather data; inspect data; process data
Physical properties	S	- design experiments - Design experiments to explore electrode materials and process materials	Expert	measuring physical properties
Project Management	K	- to plan, organize, and oversee complex projects in the battery industry, ensuring that all project elements are completed on time and within budget. This includes managing resources, risk management, and stakeholder communication.	Practitioner	project management principles; project management

Sector Specific Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Battery materials	K	- Design battery materials for lithium-ion batteries - Develop battery materials for lithium-ion batteries - Optimize materials for lithium-ion batteries - Knowledge on supply and characteristics of various battery cell materials, such as Mn, Co, etc. - Develop processes for new materials	Expert	
Cell design	K	- Understanding of battery cell design in the context	Awareness	industrial

		of raw materials and its components		design
Lithium-ion chemistry	K	<ul style="list-style-type: none"> - Specialisation in Li-ion battery technology - Understanding the trends related to the current and emerging cell chemistries 	Expert	battery chemistry
Battery components	K	<ul style="list-style-type: none"> - Understanding of battery components in the context of raw materials - Basic electrode, anode, and separator fabrication principles 	Awareness	battery components
Battery design	K	<ul style="list-style-type: none"> - Understanding of battery design in the context of raw materials 	Awareness	industrial design
Characterisation techniques	S	<ul style="list-style-type: none"> - Characterisation and validation of battery material - SEM, XRD, and electrochemical testing - Interpret material characterisation data 	Expert	

Soft Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Teamwork	K	<ul style="list-style-type: none"> - work in team within and across different departments - provide engineering support to other teams 	Practitioner	Teamwork
Adaptation	S	<ul style="list-style-type: none"> - adapt to the work environment, issues, and changes in organisation and on the market 	Practitioner	Adapt to change
Communication	K	<ul style="list-style-type: none"> - Work and communicate with external stakeholders - Communicate with team members and across different department teams 	Practitioner	Communication
Problem Solving/ Troubleshooting	S	<ul style="list-style-type: none"> - to diagnose and solve complex problems in the battery industry, including identifying root causes and implementing effective solutions. 	Practitioner	problem solving & troubleshoot

General Transversal Competence

Name	Type (S/K)	Description/Context	Level	ESCO
Reporting	S	<ul style="list-style-type: none"> - Create reports and comprehensive technical specifications 	Expert	follow reporting procedures
Meet deadlines	S	<ul style="list-style-type: none"> - Assure meeting deadlines in terms of launch objectives and product qualification 	Practitioner	meet deadlines
Planning/scheduling	S	<ul style="list-style-type: none"> - Planning of experiments 	Practitioner	perform planning

Academic Competence (can be taken from University programme)

Name	Type	Description/Context	Level	ESCO
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	(S/K)			
Electrochemistry	K	- University level	Expert	Electrochemistry
Statistics	K	- Use statistical tools	Expert	Statistics
Material science	K	- University level	Expert	Material Science
Chemistry	K	- University level	Expert	Chemistry