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Context of the research activity	The ever-increasing demand for electric energy storage, ranging from portable electronics to electric vehicles and to renewable power stations, stimulates the development of improved rechargeable lithium batteries or other rechargeable systems with substantially enhanced energy density and greatly reduced cost. Batteries play a central role in the transition from fossil fuels to renewable energy to develop versatile and high-performance energy systems for power grid application, transport, aerospace, medical devices and robotics. State of art Li ion batteries are limited in terms of energy density, new solutions toward next generation batteries will have to approach theoretical limits of storage capacity, enhance power capability and power density, increase the cycling lifetime in order to guarantee long and stable operational life, be safe even in extreme low and high temperatures conditions. The Electrochemistry Group's activities are towards development new battery materials and chemistries that can assure better performances compared to the state of art materials currently used combined with the study of battery interfaces for selecting new hybrid designs.

Activities in detail:	-**Smart-sensing and/or self-healing devices** research activities are developed in the context of a new Flagship initiative, namely Battery 2030+, in the frame of the European Community Projects: https://ec.europa.eu/information_society/newsroom/image/document/2018-46/battery_2030_vision_4_nov_2018_E0A3BFAC-9095-6107-A5B9312C56F8A783_55328.pdf One of the main objectives of the research will be the development of smart battery cells and intelligent functionalities to achieve safer and durable battery chemistries. Smart batteries need embedded sensors to monitor the complex reactions and for extended battery life self-healing concepts need to be developed, these will be inspired from medical science and biology. - **Lithium sulfur battery** is a new emerging technology that meets the requirements of onboard technology with a potential to double specific energy. Main activities are focused on innovative C/S composites, interlayers, alternative anodes, new electrolyte formulations. Research activities are in the context of European Funded project for development and commercial scale up of Li-S battery. http://www.aliseproject.com/li-s-batteries/ - **Lithium ion battery** Development of high voltage cathodes, high capacity anodes alternative to

	graphite, new aqueous binders, lithium protection for high energy all solid state batteries. Research activities are in the context of European Funded project: http://www.ecaiman.eu -**New cell designs for high energy batteries for future (Lithium/air batteries and post Li/ion technologies)** -**From laboratory scale to battery modules**. The Electrochemistry group is part of the Energy Center Lab where the activities on electrochemical energy storage at industrial level are developed joining with other excellence in Politecnico doing research of energy and companies located in the Energy Center. http://www.energycenter.polito.it/en/about_us