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Protic and Aprotic Ionic Liquids in Combination with Hard Carbon for Lithium-Ion and Sodium-Ion Batteries

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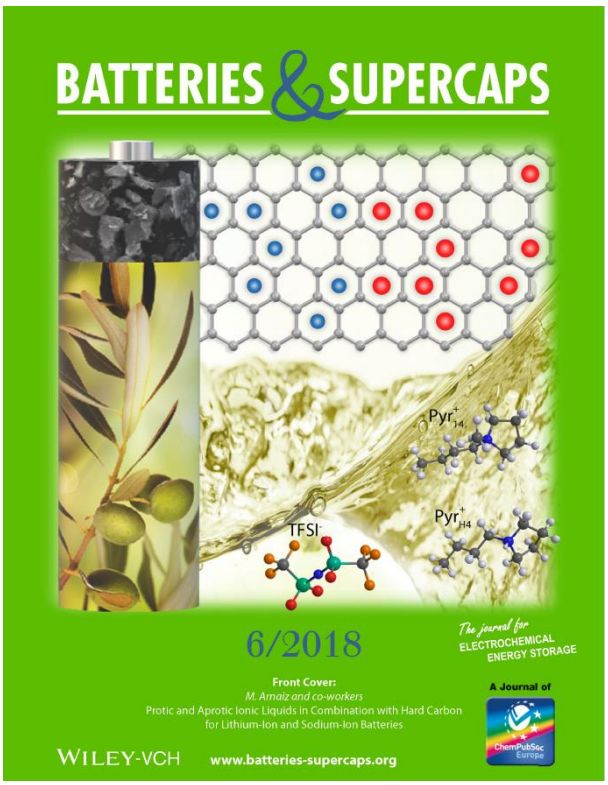

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In this work we report the use of the aprotic ionic liquid 1-butyl-1-methylpyrrolidinium bis(trifluoromethanesulfonyl)imide ($Pyr_{14}TFSI$) and the protic ionic liquid 1-butylpyrrolidinium bis(trifluoromethanesulfonyl)imide ($Pyr_{H4}TFSI$) in combination with olive pits derived hard carbon electrodes in view of the realization of advanced Li-ion and Na-ion batteries. We show that in the case of Li-based systems both classes of ionic liquids can be successfully utilized at room-temperature to build high performance and stable hard carbon-based systems. In the case of Na-ion chemistry, $Pyr_{14}TFSI$ appears very promising while the use of $Pyr_{H4}TFSI$ is not applicable due to the lack of electrochemical stability below 1 V vs. Na/Na^+.