

# **Interpretation of kinetic processes governing the operation of perovskite solar cells**

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The surge of organic-inorganic lead halide perovskites with very large efficiency has opened up the interest to understand the operation of the solar cell, in terms of physical photovoltaic processes. We have used the measurement of impedance spectroscopy in combination of voltage ramps and we present a series of insights about the physical processes occurring in perovskite solar cells in photovoltaic operation. Apart from the remarkable bulk properties of this class of semiconductors, it has been realized that the contacts are a key aspect of the operation and show dynamic interactions. We start from the distinction between capacitive and non-capacitive hysteresis, we provide an interpretation of capacitances as a function of frequency both in dark and under light, and we discuss the meaning of resistances and how they are primarily related to the operation of contacts. We aim to present a global view of kinetic processes governing the operation of the solar cell, combining electronic and ionic transport, recombination, interfacial barriers, and influence of morphologies and compositions.