Book of Abstract

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Mitigation of environmental toxicity in perovskite solar panels through perfluoroalkylated additives

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Most of the energy today is produced from non-renewable energy sources (fossil fuels such as coal, oil and natural gas, etc.), whose combustion generates greenhouse gases (CO_2, CH_4, N_2O, etc.),leading to an increase in global temperature[1]. For this reason, new alternative sources of energy have been studied, among which photovoltaics is currently one of the most prominent, given the almost infinite availability of energy and the easy access to the source. For decades, the photovoltaic market has been dominated by silicon cells, despite presenting several issues. In the last twenty years, the attention of researchers has shifted to perovskite solar cells. Since their first applications in 2009[2], these cells are characterized by excellent characteristics such as high efficiency and lightness. However, the bottleneck of this technology is related to the presence of lead in the photoactive layer. Lead is known to cause various ailments to humans, such as insomnia, fatigue, heart problems and weight loss, being classified as probably carcinogenic to humans (Group 2) in 2006 (IARC, 2006) [3]. The biggest problem occurs when cells are disposed of at the end of their life or in case of accidental breakages caused by meteorological or human phenomena. The toxicity of Pb is ranked 2nd in the priority list of toxic substances, respectively (ATSDR, 2015). Currently, there is no adequate treatment for photovoltaic devices that contain hazardous metals and their recovery [4] and, highlighting the importance to quantify metals of toxicological interest resulting from the leaching of waste materials into environmental matrices. For this purpose, leaching tests can be used to investigate the role of different organic or inorganic molecules used to reduce the release of toxic elements into the environment. Herein, we show how simple voltammetric techniques (rapid, cheap and precise) [5] can rapidly and accurately quantify the release of lead ions in aqueous solutions from these perovskite based solar cells. In addition the use of a perfluoroalkylated pyrene additive added to the hole transporting material has been evaluated to establish its effect as a screening agent in the release of this metal. The results obtained are promising, the effect that these compounds have on improving the morphology of these systems has also been evaluated through atomic force microscopy techniques.

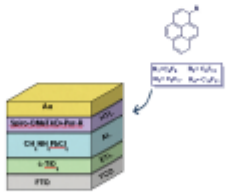

Figure: Schematic illustration of a perovskite solar cell with pyrene as an HTL additive.

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