Self-healing mechanism(s) in halide perovskites

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Considering the relatively weak bonding in halide perovskites (HaPs), it is somewhat unexpected that devices made from HaPs are as stable as they have been shown to be. This is particularly the case for high energy detectors (X-rays, γ-rays, neutron beams) where some HaP detectors have been shown to be stable to very high radiation doses. A likely explanation for this stability is that self-healing (SH) of the HaP occurs at a rate at least as fast as the rate of damage due to the irradiation. SH has been observed in many HaPs or, more commonly, in HaP devices but the mechanism of SH has not been the subject of much serious study. There is a general (rational) understanding that mobile ions are involved, but this still leaves questions as to which ions are moving as well as the possible role of chemistry in the mechanism. In the absence of firm proof for a SH mechanism, we consider the role of ion migration and (poly)halide chemistry and attempt to understand the very important role of the A cation on the SH process.