

Figure S1. AFM 3D images and topographic maps of the perovskite films at different CsBr-doping concentrations: (a) $x = 0.00$, (b) $x = 0.09$, and (c) $x = 0.15$.

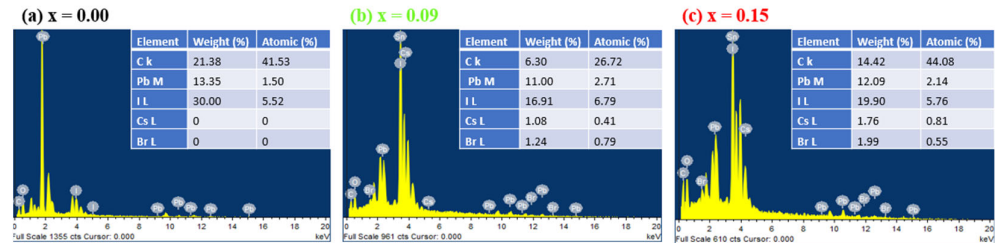


Figure S2. EDS mapping of the perovskite films doped with different CsBr concentrations: (a) $x = 0.00$, (b) $x = 0.09$, and (c) $x = 0.15$.

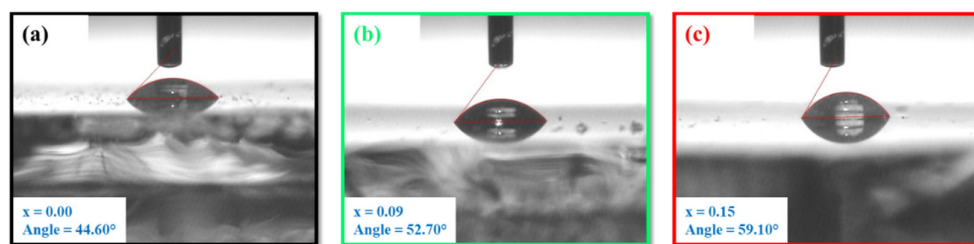


Figure S3. Water contact angle of perovskite absorber layers doped with the three different CsBr-doping concentrations of (a) $x = 0.00$, (b) $x = 0.09$ and (c) $x = 0.15$ in the absence of carbon CE.