Figure 1. (a) Optical image of as-prepared CVD monolayer MoSe$_2$ on sapphire substrates. (b) Schematic illustration of the experimental setup for hydrohalic treatments. (c) The PL intensity mappings of an individual MoSe$_2$ flake before and after HBr treatment. Profiles in (d) and (e) show the PL intensity and photon energy modulation as a function of surface location along the solid line indicated in figure (c).
Figure 2. (a) Raman spectra and, (b) statistic analysis of Raman peak energy for the as-grown and HBr-treated MoSe$_2$. (c) Raman intensity maps of a monolayer MoSe$_2$ flake before and after HBr treatment.
Figure 3. (a) Photoluminescence of the as-grown and HBr-treated monolayer MoSe$_2$ at 10 K. (b) The temperature dependence of PL for the MoSe$_2$ after HBr treatment. (c) Trion and exciton peak energies, and (d) The intensity of trion to exciton peak as a function of temperature.
Figure 4. (a) Bright field low magnification TEM image of HBr treated monolayer MoSe$_2$. (b) High resolution TEM image of HBr treated MoSe$_2$ and the inset shows the corresponding FFT pattern. (c) and (d) display the STEM images for pristine and HBr treated MoSe$_2$. (e) and (f) are the atomic model showing that the surface structure of MoSe$_2$ in (c) and (d).
Figure 5. (a), (b), (c) The XPS scans of the Mo, Se and Br binding energies for Pristine (upper) and HBr treated MoSe$_2$ (lower) respectively. (d) The proposed chemical structure change showing the effects of HBr treatment. (e) The atomic ratio versus Mo(IV) for as-grown and HBr-treated MoSe$_2$. 