Two-dimensional transition metal dichalcogenide (TMDCs) like molybdenum disulfide (MoS2) and tungsten disulfide (WS2) proved themselves desirable optoelectronic devices with their adaptable electric, optical and chemical properties. To meet the different requirements of applications, heterostructures and chemical treatments were both developed to manipulate and transcend their properties. However, post-heterostructure-formation plasma treatment were seldom discussed. In this dissertation, MoS2/WS2 vertical and lateral heterostructure were grown and treated with air plasma. We found that vertical heterostructure and lateral heterostructure behaved differently. For vertical heterostructure, it was confirmed by the ratio of the Raman shift intensity which the top WS2 layer behaved as a shield for the underlying MoS2 monolayer from oxidizing and forming transition metal oxide nanoscrolls. On the contrary, for the lateral heterostructure, the WS2 that was grown surrounding the MoS2 triangular core served as a tight frame to stop the propagation of the oxidized MoS2, resulting a gradient of crack distribution. These finding provided insight into how plasma treatment can have effect on the formation of oxide in heterostructure, which can have further application in nanoelectronic devices and electrocatalyst.