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A comparative AFM study of carbon alloyed Mo-Se-C and W-S-C films for tribological applications

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Transition metal dichalcogenides have layered structure and are therefore promising self lubricating films. They can be considered as potential substitutes for carbon based films in various environmental conditions. In this work, a comparative atomic force microscopy study of co-sputtered Mo-Se-C and reactive sputtered W-S-C films is performed. Both films are alloyed at approximately 55% carbon. The microstructural features of these films are characterised using scanning electron microscopy and x-ray diffraction. The nature of the chemical bonds is studied by Raman spectroscopy. The topography, friction forces and pull off forces of the films are evaluated by means of atomic force microscopy and spectroscopy. The results show that the roughness parameters of Mo-Se-C film are lower than that of W-S-C films. Adhesion forces of these films based on pull-off force measurements show that Mo-Se-C films have higher pull off forces than W-S-C films. We developed an AFM technique to estimate microscopic values of friction coefficients and to characterise the nature of surface changes due to nanotribological experiments. The friction force and friction coefficients of Mo-Se-C films are lower than that of W-S-C films.