The effect of different concentration of atomic hydrogen content on the degree of graphitization of carbon thin films deposited energetically using a Filtered Cathodic Vacuum Arc (FCVA) deposition system is studied over working temperature intervals from room temperature up to 200˚C using in situ Raman spectroscopy on two types of the oriented graphitic carbon thin films containing distinct sp^2 fractions.

The effect of atomic hydrogen spill over from molecular H_2 on a variety of nanostructured carbon materials has been studied using Raman spectroscopy and other techniques in recent years to elucidate the mechanism behind hydrogen sensing and storage. Hydrogen adsorption on sp^2-bonded carbon surfaces requires locally changes in hybridization of the sp^2 to sp^3 bond in the carbon lattice, which would lead to a change in the electronic and other properties of the films.

The samples of interest consist of various fractions of sp^2 initially at room temperature. Here, the carbon sp^3/sp^2 ratios drastically change in terms of temperature and hydrogen content on the oriented graphitic samples therefore, the properties of these structures change at certain conditions.

The Raman spectra indicate there is no change in the films structures but there might be lucid attraction in defects and therefore the possibility of increase in the C-H bonds cause the changes in I_D/I_G ratio alteration and in FWHM. The significant effect of atomic hydrogen on highly oriented carbon thin film might be due to a bandgap creation where is predictable in films containing equal portions of sp^2 and sp^3.