The extreme low coefficient of friction, hardness and high thermal conductivity of CVD diamond like carbon coatings films, can play an important role in the oil, gas and petrochemical industries in different kind of components (for example valves and mating parts) for wide range of applications are susceptible to a build-up of frictional forces in very aggressive chemical conditions, including H2S hydrogen sulfide. In many cases, coating with protective films may prevent future problems and extend the devices lifetime [2]. The current work is an interface study for DLC/SiH/Steel to understand the DLC excellent adhesion proprieties on API 5L steel, endorses its use anti-corrosion and protection applications. In this work, the DLC coating were grown by Chemical Vapor Deposition (CVD) method using 1 kV deposition voltage and the films were studied by scanning electron microscopy (SEM) and Raman Spectroscopy to study the interface nature of CVD diamond films grown on API 5L steel substrate [1]. Cross-sectional and surface SEM images were to measure the thickness of DLC films and elemental composition of the DLC film was determined by energy dispersive X-Ray analysis (EDX) using Quanta 450 from FEI Company. Figure 1 shows the surface morphology of deposited DLC film was continuous, smooth and uniform. Typical cross-sectional interface SEM image of DLC film presents an uniform thickness about 4 µm and good adhesion including a silicon interlayer. The energy dispersive X-Ray analysis (EDX) mapping results (figure 2) confirm the Carbon, silicon and iron presents in the sample. The Raman spectra shows the typical peak from DLC films (sp2 and sp3) related to the microcrystalline size of the graphitic cluster to 1kV deposition voltage (Figure 3). It is clear that more investigations are necessary to better understand the good adhesion, like adhesion tests and transmission electron microscopy (TEM) samples will be prepared using focused ion beam (FIB) to explain what is the SiH interlayer role in good adhesion properties.

References
Fig. 1: SEM images from surface and cross-section interface from DLC coating on API 5L Steel substrate.

Fig. 2: Energy dispersive X-Ray analysis mapping (EDS) from cross-section DLC film.

Fig. 3: DLC film Raman spectra to 1kV and 0.8 kV deposition voltages