The alloys based on the Fe-Mn-Al system are good candidates to replace the conventional stainless steel, which are based on the ternary alloy Fe-Ni-Cr. The Fe-Mn-Al system offers the possibility to replace strategic elements as Ni and Cr by others lighter and cheaper as Mn and Al, in addition it has attractive mechanical and corrosion resistance properties [1, 2]. Fe-9Cr-Mo is an important material for super-heater tubes in a power industrial plant. The presence of Mo enhances creep strength above 600 °C while chromium helps in forming a chromium-rich scale which protects the steels from further oxidation [3]. The aim of this paper is to investigate the oxidation behavior of Fe-9Cr-Mo (FCR) in comparison with oxidation behavior of two Fe-Mn-Al-C-Cr-Mo-Si alloys with different molybdenum (Mo) content, named as Mo(0) to sample without Mo and Mo(1) to specimen with Mo. The experiments were carried out at 600, 700, 750 and 850 °C, each one during 72 hours in static air. The oxidation kinetics was measure as a function of time using a Thermogravimetry analyzer, TGA. X-ray diffraction (XRD), Energy Dispersive Spectrometry (EDS) and Integral Conversion Electron Mössbauer Spectroscopy (ICEMS) [4] were used to characterize the structure and composition of the oxide scale. The TGA results show that at all oxidation temperatures the sample FCR exhibit the lowest kinetic corrosion and the lowest weight gain, whereas Mo(0) the highest, showing an important effect of Mo addition in Fe-Mn-Al-C samples. The highest weight gain is presented at high temperature oxidation testing to all samples. The oxidation products found in the external part of scale by XRD and EDS measurements were principally manganese-iron oxides in Mo(0) and Mo(1) samples, and iron-chromium oxides in FCR samples. In the internal part Mn(Fe, Al)₂O₄ and (Fe, Cr)₂O₃ species were found, respectively. By ICEMS technique were found hematite, probably maghemite, α-Fe and a paramagnetic doublet in FCR samples, but the line width of sextets is big, may be due to poor crystalline order. The intensity of peaks of α-Fe was reducing as oxidation temperature amount, whereas the intensity of peaks of oxidation products increases. In the others samples, a broad magnetic sextet was observed and has been fit by one hyperfine field distribution with mean hyperfine field characteristic to ferritic/martensite phase, one doublet and one singlet, as is show in Fig. 1. Samples oxidized at the higher temperatures exhibit a strong paramagnetic line, probably due to Cr or Mn oxides may be enriched on the surface layer, in addition to small amount of iron, then the antiferromagnetic interactions predominate on ferromagnetic interactions in the external part of scale, as is discussed inside the paper.

![Figure 1. ICEMS spectra of sample Mo(0) oxidized at 600 °C, during 72 hours in static air.](image-url)