

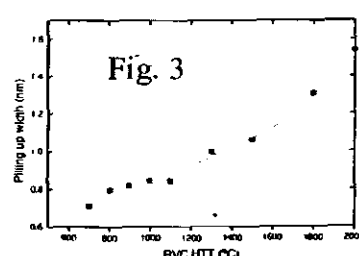
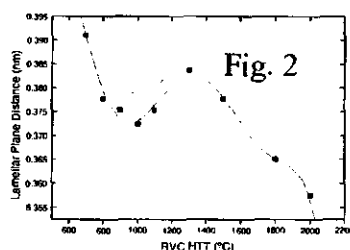
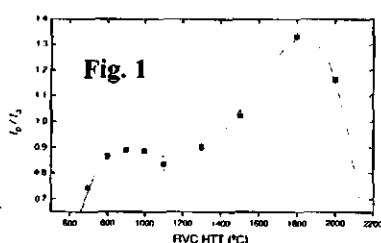
Dynamics of Defects and Surface Structures Formation in Reticulated Vitreous Carbon

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Morphological and microstructure properties of Reticulated Vitreous Carbon (RVC) were analyzed by Scanning Electron Microscopy (SEM), Micro-Raman Spectroscopy and X-Ray diffraction (XRD) techniques as a function of heat treatment temperature (HTT). Samples treated between 700 and 1000°C presented a decrease of lamellar plane distance (d_{002}) (Fig. 2), increase of pilling up width (L_{002}) (Fig. 3) and increase of I_D/I_G ratio (disorder to graphitic intensity ratio) (Fig. 1). In this range, material is changed from pyropolymer to carbon. The precursor polyfurfuryl alcohol has furanic groups and its cure provides appearing of methilenical bonds and the catalyst also presents sulphur atoms. At higher HTT, these atoms are gradually liberated from material structure. Their presence represents the impediment of graphitic lamellar structure formation. Possibly, decrease of d_{002} in this range is related to influence of this aspect, facilitating the pilling up increase. In addition, the gradual liberation of heteroatoms allows appearance of holes in structure, corresponding to increase of I_D/I_G recorded in this range. All these parameters are stationary between 900 and 1000°C, indicating that this process related to heteroatoms is extinguished in this range [1]. Between 1000 and 1100°C, d_{002} decreases discretely as well L_{002} and I_D/I_G . In this range, there are no relevant chemical changes, but a structure rearrange process begins with the L_{002} and d_{002} decrease, generating a discrete structure ordering after the exit of smaller atoms [2]. At 1100°C, such parameters increase up to HTT of 1500°C. The L_{002} and d_{002} increase is accomplished by relative increase of disorder band (I_D/I_G) related to turbostratic structure formation. Around of 1500°C, d_{002} starts to decrease, accomplished by the accented L_{002} increase. When this process occurs with I_D/I_G decrease, it could be associated to the beginning of anisotropic structure formation that usually starts after 1800°C. For lower HTT other processes are also associated with the paralelization and approximation of lamellar surfaces promoting a more intense formation of strong and weak confluences in RVC turbostratic structure.



[1] C.A. Leon y Leon, L.R. Radovic. Interfacial Chemistry and Electrochemistry of Carbon Surfaces. In: Thrower PA, editor. Chemistry and physics of carbon, vol 24, New York: Dekker (1994) 213-310.

[2] G.M. Jenkins, K. Kawamura. Polymeric carbons – carbon fibre, glass and char. Cambridge University Press: Cambridge (1976) 83-108.