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SEM Observation of Non-Metallized Samples in Paleopalynology

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Paleopalynology studies the organic content (kerogen) preserved in the rocks and palynomorphs are essential to provide information about their ages and environments. Their biological origin can be explored applying several techniques, some of them are non-destructive (e.g. white light microscopy, fluorescence, interference, LASER confocal, FTIR) and others are destructive (e.g. SEM, TEM, geochemistry). If you want to study the specimens with various methodologies it is important to avoid destructive methods and keep them free of foreign elements that can contaminate them [1, 2, 3, 4, 5, 6, 7, 8, 9].

In the traditional floor models of Scanning Electron Microscope (SEM) the non-conductive samples need to be metallized, generally with a thin gold or gold/palladium film, to obtain high quality images in high vacuum (HV). Therefore, it is not possible to carry out more studies of the same specimens with other methods after SEM analyses. Some equipments allow the observation of non-conductive materials without metallization using low vacuum (LV) technique with a slight loss in the sharpness of the images compared to the HV ones [10, 11]. Considering the specimens are preserved free of contaminants it is a minor loss.

Desktop SEM allows to take high quality images in non-conductive and non- metallized samples in low and high vacuum condition. This is possible thanks to the use of lower accelerating voltages, smaller beam currents and smaller working distances (WD) than in the floor models. In addition, this instrument have other advantages like a simplified interface and faster operation system, a small size that makes it relatively portable, reduced workspaces, shorter installation and maintenance times and a lower cost. All these advantages are more significant than the reduced volume of the sample chamber, the lower possibilities of choosing the observation conditions and a lower resolution [10].

We present the result of the analysis of a non-conductive and non-metallized sample bearing specimens of palynomorphs in a Desktop SEM with both LV and HV techniques. Subsequently, it is metallized and illustrated again at LV and HV in the same microscope. The palynomorphs were recovered from the organic residue manually (picking) and temporarily mounted in a slide (with water media) to be pictured in a biological microscope with white and fluorescent lights. After, the specimens were transferred to a small glasss lide that is wrapped in a foil adhered to the stub [11, 12]. All images obtained (Figs. 1 and 2) reveal similar morphological details not visible in optical microscopy that are necessary to define or confirm the taxonomic assignment (species). Typical charged areas observed in non-conductive and non-metallized samples under standard SEM (HV) are not evident using Desktop SEM [10]. Therefore, this result confirms the Desktop SEM is a non-destructive method that can be used before the application of destructive procedures.

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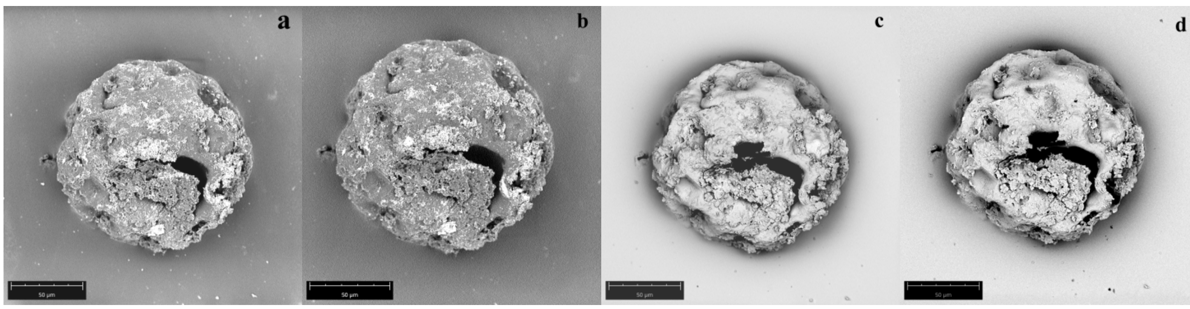

Figure 1: *Leiosphaeridia* sp. 1 (repository number UI406): a) non-metallized in high vacuum. b) non-metallized in low vacuum. c) metallized in high vacuum. d) metallized in low vacuum (SEM Phenom Pro, 5 KV, mode Full). Scale bar = 50 µm

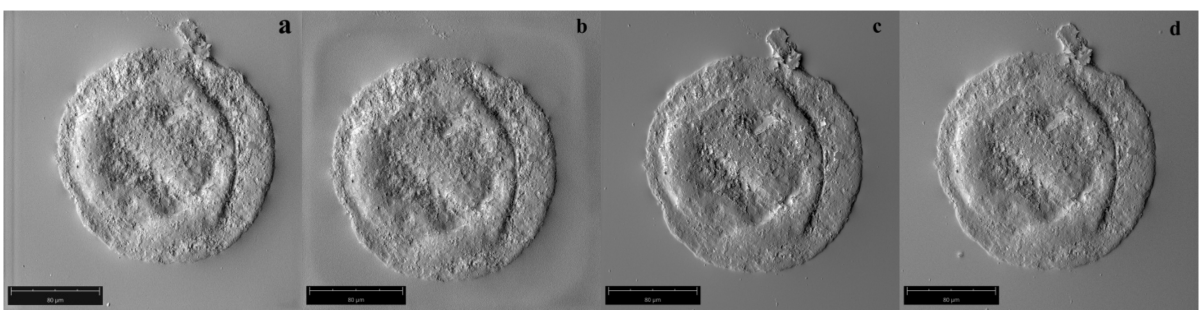

Figure 2: *Leiosphaeridia* sp. 2 (repository number UI406): a) non-metallized in high vacuum. b) non-metallized in low vacuum. c) metallized in high vacuum. d) metallized in low vacuum (SEM Phenom Pro, 5 KV, mode Topo A). Scale bar = 80 µm

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