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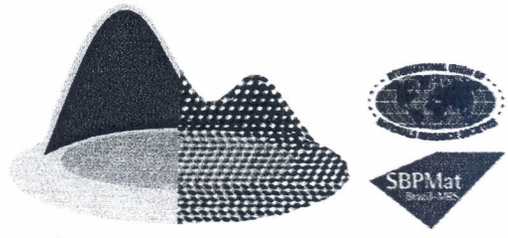

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"Study of polyaniline films morphological properties with AFM in optical pH sensors" (I564)

by the authors Rafaella T Paschoalin, Clarice Steffens, Alexandra Manzoli and Paulo Sergio de Paula Herrmann

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Study of polyaniline films morphological properties with AFM in optical pH sensors

R.T. Paschoalin[1,2], C. Steffens [1] , A. Manzoli[1] and P.S.P.Herrmann Jr.[1] *

(1) Alan G. MacDiarmid Institute for Innovation and Business and National Nanotechnology Laboratory for Agribusiness (LNNA), Embrapa Agricultural Instrumentation, P. O. Box 741, 13560-970, São Carlos, SP, Brazil, e-mail: herrmann@cnpdia.embrapa.br
(2) Universidade Central Paulista, UNICEP, P. O. Box 511, 13563-470, São Carlos, SP, Brazil.
* Corresponding author.

Abstract – In this work, the effect of pH was investigated on the morphological properties of optical pH sensors with thin films of polyaniline (PANI) as active layer. The optical pH sensors were prepared by the line-patterning technique on PET (poly(ethylene terephthalate) substrate and coated with thin film of polyaniline emeraldine oxidation state-HCl (PANI-HCl) salt, obtained by "in situ" polymerization method. The results showed that the pH has great influence in the polymer layer morphology of these sensors.

The polyaniline (PANI) has appropriate optical properties for optical pH sensors. The PANI pH change sensitive electronic absorption band is very broad [1] and its optical pH sensors are suitable to measurement in the range of pH 2-12 [2]. This way, the optical pH sensors with thin films of PANI as pH sensing layer represents an interesting alternative to indicator-based sensor films due to their advantages in terms of size, costs, and response time.

In this work, optical pH sensors were prepared by the line-patterning technique [3] on PET substrate and coated with a thin film of polyaniline by "*in situ*" polymerization method. The pH effect on morphological properties of these sensors was analyzed with Dimension V (Veeco) atomic force microscope. The optical pH sensors were immersed for five minutes in three different pHs (2, 7 and 12) and the 3D images are showed in the Figure 2. All images were obtained in tapping™ mode with scan rate of 1 Hz. The root-mean-square roughness (Rms) and mean roughness (Ra) were calculated using WSxM 4.0 software from Nanotec Electronica S.L. (copyright© November 2003).

It can be observed that optical sensors in pH 2 showed a higher value of roughness than that in pH 7 and 12 (Figure 1). It was also verified that Ra and Rms values were very close. The PANI films morphology were globular, showing a more flat surface for the pH 7 (Figure 2), which is in agreement with the lowest roughness value obtained with this pH. These results show that the pH has great influence in these sensors polymer layer morphology.

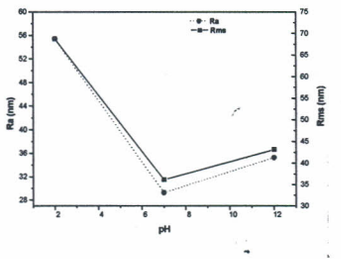
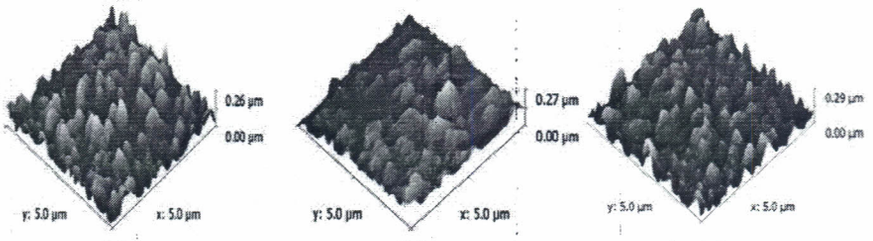


Figure 1: Average roughness (Ra) and root mean square (Rms) in different pH.



(a) (b) (c)

Figure 2: 3D images of thin films of polyaniline on optical pH sensors: a) pH 2, b) pH 7 and c) pH 12.

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