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A SURFACE TENSION MEASUREMENT METHOD FOR BIOMATERIALS APLICATIONS USING DIGITAL IMAGING ANALYSIS

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Effects of surface tension are present in the most diverse situations, such as the processes of biomaterials osteointegration and many others [1]. The purpose of this project was to develop a methodology for measure of properties of surfaces, in particular, surface tension (surface energy) and contact angle. The present work is divided in two areas, computational and experimental. Image reading, conversion, segmentation, reduction and enhancement techniques besides search in matrix were put into the algorithm that calculates superficial tension and contact angle from a sessile drop image. Once the drop's theory shape arises from the Laplace classic equation that relates pressure difference through the curve interface, it was also implemented into the algorithm. An experimental plan was created using steel shafts and staples to allow the high resolution image capture, proportioning measurements with high precision.
A device for catching images generated from the system surface solid / liquid able to keep variables under controlled conditions was created. The device consists of an optical microscope Zeiss LABOVAL pol.d for obtaining macro images with an attached digital camera. A program in C language was used for processing measured experimental data (measured) [2, 3] that reads the digital image and calculates the surface tension in 5 steps.
This work has succeeded in developing a methodology to measure the properties of surfaces, in particular, surface tension and the contact angle. The experimental device proved to be adequate for obtaining images captured in static situations and has set limitations inherent in the system that should be control. The program of capture and analysis of the images originated from a very simple algorithm and has evolved into a highly efficient and reliable way of determining the parameters of interest. The parameter of scale of shades of gray in the pictures (grayscale) is currently regulated manually for each photo and this will be done automatically at the end of the new amendment which is in development. It was also observed that the measurement of surface tension is very sensitive to the variables of the system, but despite this, the method of a drop supported proved to be efficient to provide the contact angle between the drop and solid surface, allowing therefore obtaining the value of the interfacial tension between the fluid and its supporting surface.

References:

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