

INVESTIGATION OF FLAX YARNS FROM ITALIAN PAINTINGS USING AFM MECHANICAL CHARACTERIZATION

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Previous studies have shown interest in the use of the Atomic Force Microscopy (AFM) to investigate the parietal mechanical properties of hemp or flax fibres, in correlation with their structure or maturity (1–3), especially in PeakForce Quantitative Nanomechanical Property Mapping (PF-QNM) mode. However, this technique is relatively new and its application is often limited to the engineering and biological fields, but the small quantity of the sample required makes it a useful tool also to study materials from the cultural heritage. In this research, two yarns of few centimetres were taken from the back of four Italian paintings of the art gallery of Ascoli Piceno, dated around 1600-1700, and one yarn of each pair was selected for the AFM mechanical characterization. PF-QNM analysis was performed with a Multimode AFM (Bruker Corporation, USA) equipped with a RTESPA-525 probe (Bruker Corporation, USA) and a maximum load of 200 nN; the cantilever was carefully calibrated using the Sader method and the indentation modulus of Highly Oriented Pyrolytic Graphite (HOPG) was taken as reference.

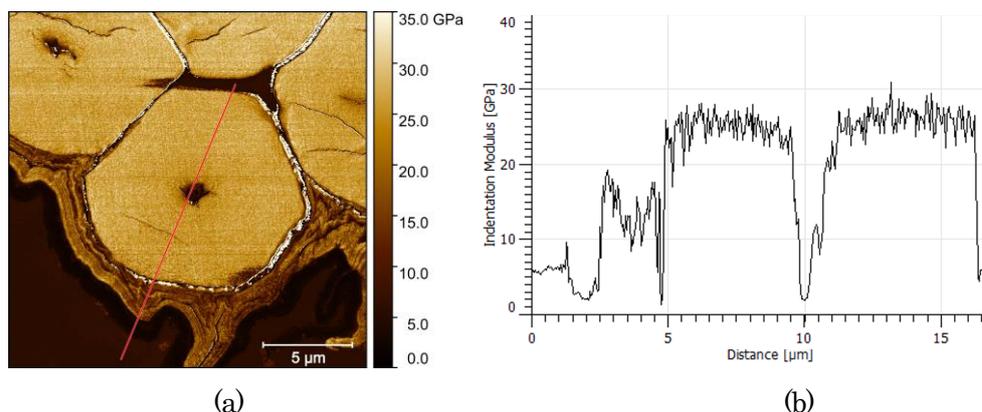


Fig.1 a) Flax fibre bundle of “Madonna con il Bambino” of Nicola Monti and b) profile (red line in a) of the indentation modulus

Figure 1 shows an acquisition obtained from “Madonna con il bambino” of Nicola Monti (dated between 1772-1782) and a profile extracted with the Gwyddion software, where the values of the indentation modulus are reported. For the four samples, indentation moduli values were obtained and compared to a fresh flax yarn taken as a reference sample. Relevant information about flax cell walls properties and conservation of the samples, in link with the potential durability of the flax employed in biocomposite materials, will be discussed.

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