

SURFACE: A MICRO INSTRUMENT FOR *IN SITU* XRD-XRF AND OPTICAL MEASUREMENTS

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The "SURFACE MONITOR" instrument is an innovative and integrated portable XRD-XRF apparatus combined with a reflectance spectro-photometrical system. The instrument was designed by ISMN-CNR and Assing in the framework of an European project (EUREKA-Eurocare) "Surface Monitor", aimed to develop a portable system of multispectral analysis for the not destructive and not invasive characterisation of archaeological artefacts. Concerning the XRD analysis, the innovative design of the SURFACE MONITOR equipments allows to carry out the characterisation by using a Theta-Theta configuration from -10 to $140^\circ 2\theta$. XRD analysis can be also carried out in angular scan and in energy scan modality. The data collected by the detector are elaborated in an innovative 3D mode, indeed, for each step, the XRF spectrum is first stored and then all the fluorescence spectra are represented in a three-dimensional mode, by plotting the energy on the abscissas, the scan angle on ordinates in a horizontal plane and the measured intensity in the vertical plane (Z co-ordinates). By plotting the results in this mode, the user can friendly decide "to cut" the XRD spectrum to the wavelength of more interest, within the used energetic range in the experiment and to filter the scattering that reduces the signal-to-noise ratio. According to this new approach, the XRD spectrum is obtained not to as a single window of energy, but using all the available energies and therefore it turns out extremely more resolved, also using lowest powers. In order to validate this new instrument a large scale characterisation of metal archaeological artefacts has been carried out also for gaining deep insight into the micro-chemical structure of the stratified corrosion layers and of the bulk metallurgical features. This innovative apparatus and approach has evidenced that SURFACE MONITOR with its optical, XRD and XRF facilities have significant potential in studies of the corrosion products of archaeological silver and copper objects for their stabilisation and conservation.

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