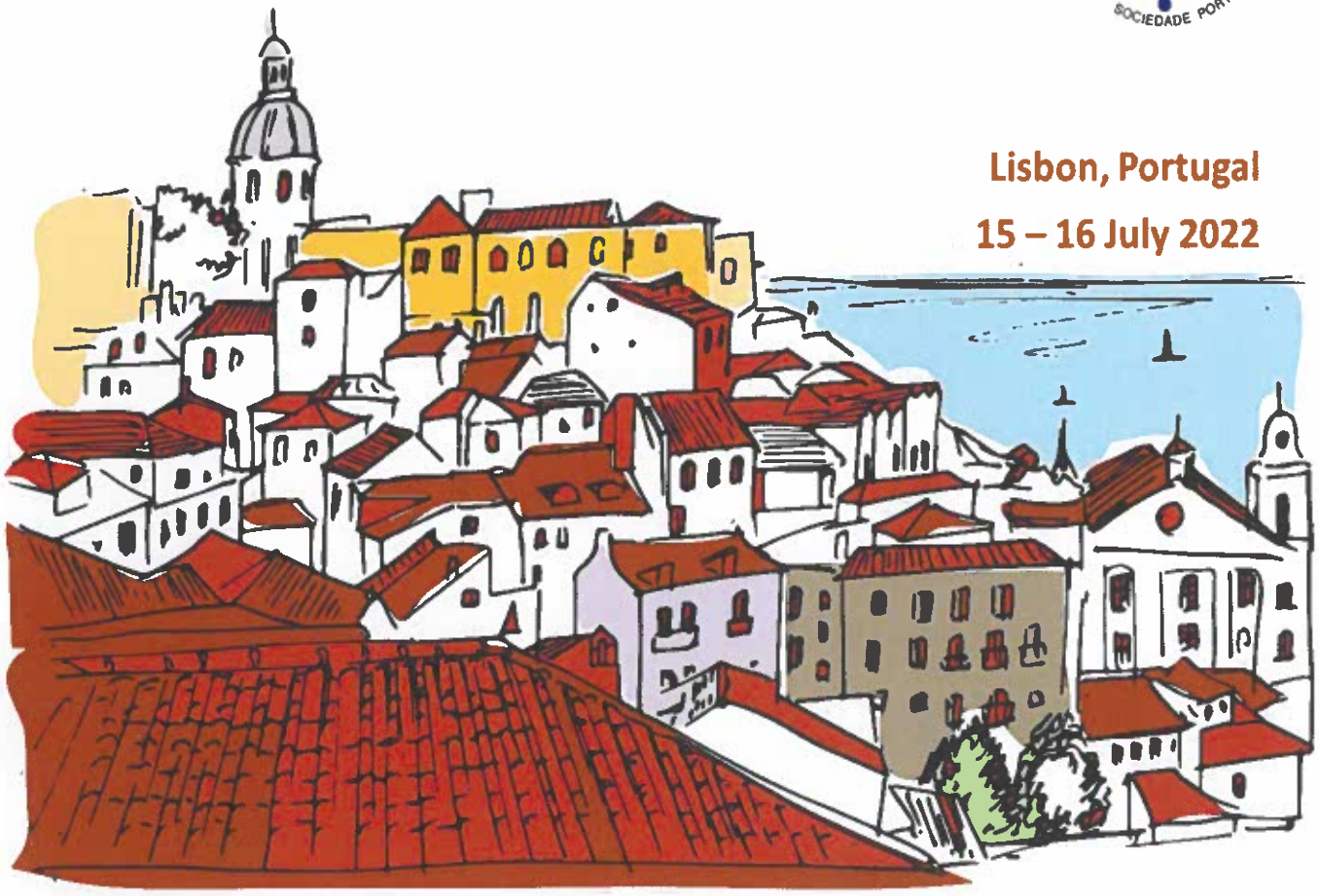
2nd National Crystallographic Meeting



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BOOK of ABSTRACTS

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A XANES approach to the blue pigments in ceramic heritage

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The blue colour has been extensively used as a ceramic pigment, particularly in Chinese porcelain production. Cobalt blue is a stable pigment at high temperatures and seems to be a little affected by the firing atmosphere, unlike other transition metals, which change their colour depending on the firing atmosphere. Synchrotron radiation-based techniques have been applied to studying cobalt speciation in the Chinese blue-and-white porcelain to determine the cobalt and iron oxidation state and local coordination environment. The relationship between the firing atmosphere conditions and cobalt speciation has not been studied yet. In this work, underglaze blue models were produced and fired in air or under reducing atmosphere to ascertain the effect of the firing atmosphere on cobalt and iron speciation. The experimental results were compared with data obtained on historical samples of ancient porcelain shards. The microstructure and colour of the underglaze blue models were ascertained by variable pressure scanning electron microscopy (VP-SEM-EDS), using a hyperspectral imaging camera (Vis-SWIR reflectance spectroscopy) and colorimetry. The formal valence and coordination of cobalt and iron ions of the glaze were determined by X-ray absorption spectroscopy (XAS), particularly X-ray absorption near edge structure (XANES), using synchrotron radiation. Spectral features demonstrated that both cobalt and iron speciation were affected by the firing atmosphere and therefore could be used to ascertain the firing atmosphere.