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BUILDING IRON BASED MATERIALS COMING FROM THE XIX CENTURY CASTLE OF VILLA PALLAVICINI, GENOA.

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In Liguria, during the first half of the XIX century, iron was produced through the direct process (i.e. by bloomery fire) although in Europe the indirect method (i.e. by blast-furnace) has been used since the end of the XVIII century [1-6]. The delay in the adaption to the new production process is connected with political and economic factors. In effect, the government of the Sardinia Kingdom, to which Liguria belonged between 1815 and 1861, prevented the use of imported iron supporting the exploitation of the classical production techniques still in use on its territory [1].

The diagnostic study carried out on the occasion of the restoration of the castle placed inside Villa Pallavicini's park (built between 1836 and 1846, Genova Pegli) gave the opportunity to verify the iron producing technique in Liguria during the XIX century. The preservation work, was commissioned by the City of Genoa and made by the restoration laboratory 'Mauro Vita Restauri e Conservazione' (Pordenone).

Our attention was focused on the investigation of 13 samples belonging both to pieces coming from the inner parts of the walls (e.g. iron for supporting the external main gate) and to outdoor artifacts (e.g. balustrades and bars). The aims of the work were: material characterization and definition of its state of conservation (e.g. analysis of corrosion layers); identification of a coherence between the used base material and the historical information; to verify the presence of more recent parts. Moreover it is known that the Durazzo Pallavicini family, client of the architectural complex, held bloomer fires at Sassello (Sv) and wanted to keep active if not to improve their use [1]. Therefore it is possible to assume that the iron parts of the castle were fabricated using the furnaces of the family.

The samples were analyzed by means of: Scanning Electron Microscopy (SEM; specifically SEM micrographs were obtained using detectors for secondary electrons, SE, and, backscattered electrons, BSE) and Energy Dispersive X-ray Spectroscopy (EDS); Light Optical Microscopy in Bright Field and Dark Field (LOM-BF and LOM-DF); Micro-Raman spectroscopy (μRS).

The results of the performed analyses showed that a unique sample, named 9L, coming from the inner parts of the walls, does not have slags and presents an homogeneous microstructure (Fig. 1). The observed peculiarities allow to affirm that the piece from which sample 9L was taken was produced through the indirect process.

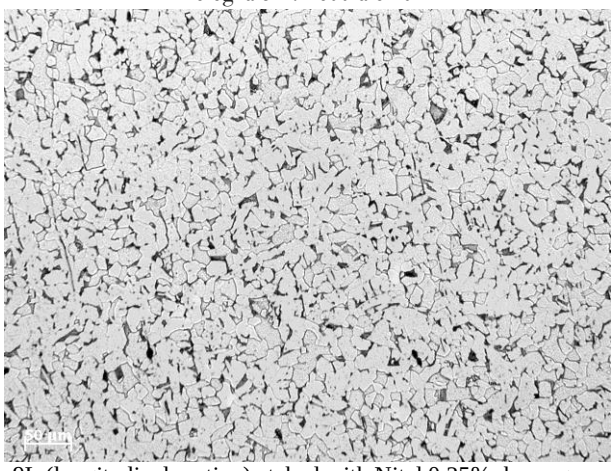

Fig. 1. LOM BF 200x, Sample 9L (longitudinal section) etched with Nital 0.25%: homogeneous microstructure and absence of slags (indirect method)

On the other hand, all the other samples show the presence of many silicon based slags, (Figs. 2, 5 and 6), typical of a direct process, and an heterogeneous microstructure (Figs. 3 and 4).

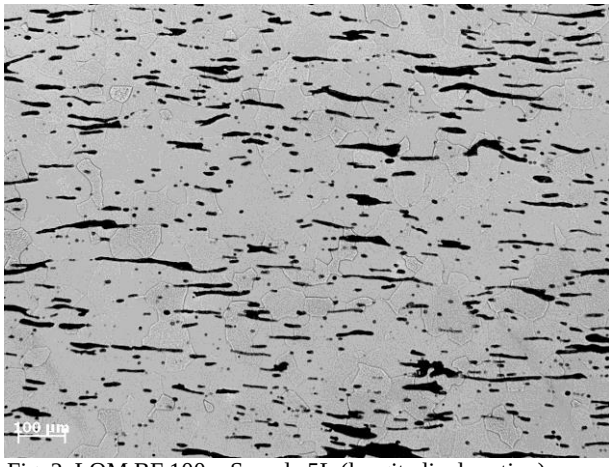

Fig. 2. LOM BF 100x. Sample 5L (longitudinal section):. many slags are visible (direct method)

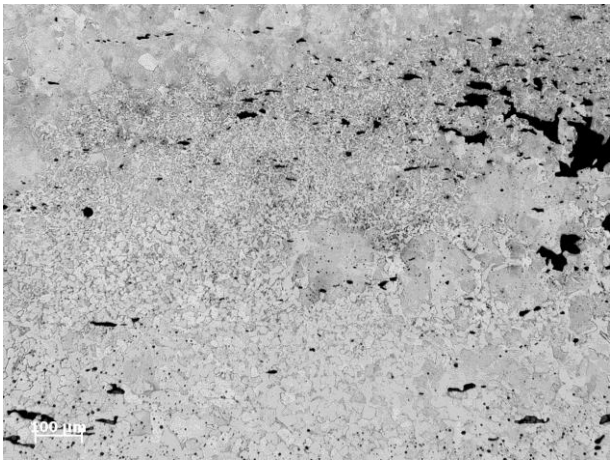

Fig. 3: LOM BF 100x, Sample 5T etched with Nital 0.25%. (transversal section): heterogeneous microstructure (direct method)

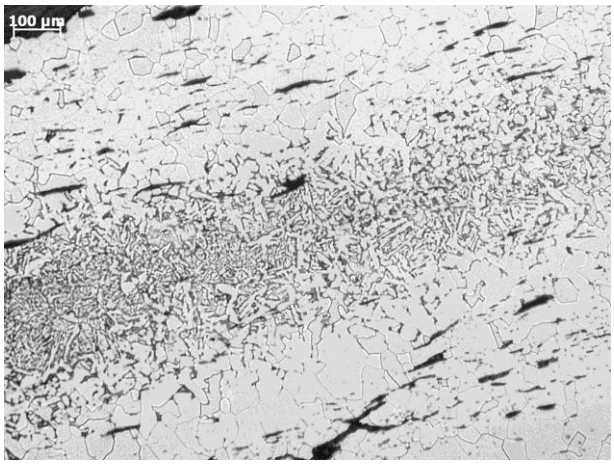

Fig. 4: LOM BF 100x, Sample 13T etched with Nital 0.25% (transversal section): heterogeneous microstructure (direct method)

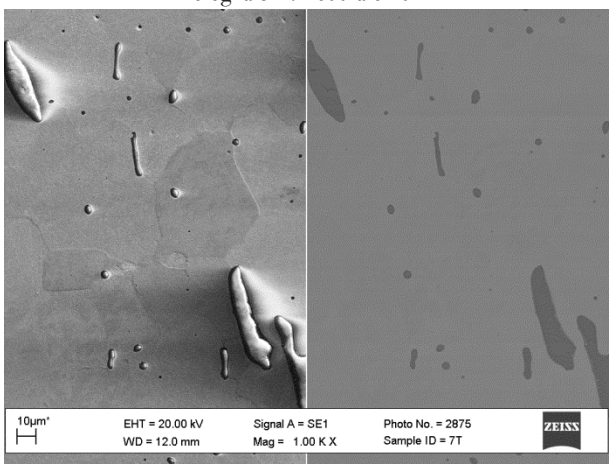

Fig. 5. Sample 7T , etched with Nital 0.25% (transversal section): on the left SEM SE micrograph (1000x) and on the right SEM-BSE micrograph (1000x): many slags are visible (direct process)

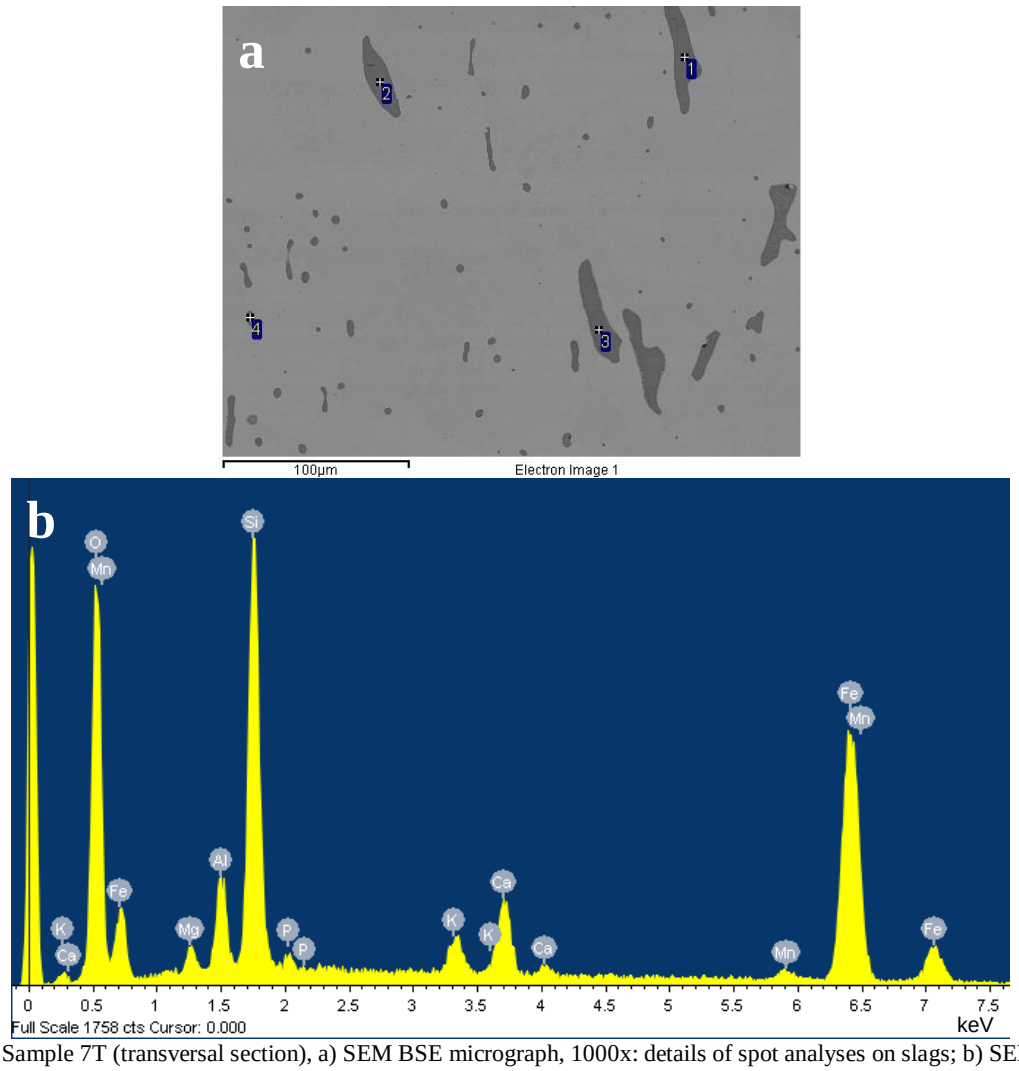

Fig. 6. Sample 7T (transversal section), a) SEM BSE micrograph, 1000x: details of spot analyses on slags; b) SEM EDS spectrum: qualitative composition of slags

Sample 9L might be considered an addition due to previous restoration or consolidation processes applied to the building. Its high degradation rate does not allow any assumption concerning the exact period of introduction of such an object.

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