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Elemental Depth Profiling using Negative Muon Implantation and X-ray Tomography of a Copper based Bust representing: the Head of Crying Child.

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Copper based busts in the shape of heads or shoulder high length, are known from the Renaissance, e. g. the small statuettes of the Virgin and Christ, with heights under 15cm by François Duquesnoy [1] to busts of heights over half a meter [2]. The bust presented in this paper has no comparison to Renaissance statuettes. The contorted face of the Bust, height about 22cm, reminds one of the Character Heads of Franz Xavier Messerschmidt (1736–1783) [3]. The bust of a crying child has been investigated using negative muons. Negative muons are implanted at a known depth and during the capturing process X-rays are emitted, characteristic of the capturing atom. This statuette comprises of ~CuZn24. At higher momentum implantation the composition of the inner core of the statuette comprises of calcium sulphate. The material depth profile as obtained from negative muon experiment has been compared with the X-ray tomography on the bust of the crying child. Since the bust is open on the bottom, we were able to check the core body and confirm calcium sulphate as core material and confirms our results. One also observes a small iron object in the middle of the core material which was identified by X-ray tomography as a nail.

The zinc content of the studied bust, 24%, is much higher than one normally finds in Renaissance bronzes and brasses and indicates a later manufacture date. The results show that the method can be used for 'closed' statuettes: providing information on the core material and alloy composition in a non-destructive way.

[1] François du Quesnoy. Marion Boudon-Machuel. (2005) Paris.

[2] The culture of Bronze (2019). Peta Motture. ISBN978-1851779659.

[3] Die Fantastischen Köpfe des Franz Xavier Messerschmidt (2007). Hirmer Verlag. ISBN978-4336533777.

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