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About 57 Mt of mine tailings were dumped directly into the sea from 1957 to 1990 as a result of the open pit exploitation of Pb and Zn ores in Sierra de Cartagena - La Unión district, SE Spain. This led to the infilling of Portmán Bay and a seaward shoreline advance of ~ 600 m associated to the development of a submarine extension of the resulting deposit. Whereas several investigations have been carried out in the emerged portion of the tailings deposit, little information exists on the dimensions and properties of its submerged portion. Nowadays, a restoration project intends to move back the shoreline by ~250 m by dredging part of the subaerial deposit.

This contribution focuses on the sedimentological and physical properties of the materials forming the submerged deposit from where accumulation patterns could be derived. With this purpose a number of up to 4 m long gravity cores where obtained from R/V Ángeles Alvariño during the 2018 NUREIEVA-MAR1 research cruise. Subsequently, Multi Sensor Core Logger (MSCL) measurements were performed on whole and split sections in order to obtain the physical properties of the materials, namely gamma-density, magnetic susceptibility, p-wave velocity and non-contact resistivity. Furthermore, split core sections were visually described and imaged.

This led to the identification of 4 main units in the sampled materials. From bottom to top, Unit 1 consists of light-colored, bioclast-rich fine-medium sands indicative of pre-dumping inner shelf sedimentation. Unit 2 appears only in some distal cores (~ 1.3 km from shore) collected at water depths of about 40 m and is composed of brown-dark grey silty clays with abundant black patches. All measured physical properties display low and homogeneous values. This unit could be interpreted as of transitional character in between pre-dumping conditions and the first arrival of mine waste. Unit 3 is made of highly laminated clayey silts punctuated by dark sand layers and its physical properties show generally high and oscillating values. Unit 3 corresponds to the mine tailings in stricto sensu. Finally, the upper Unit 4 is composed of bioturbated homogeneous sandy silts with generally diminishing values for most of the measured physical properties. This unit results from the reworking of materials from the top of the tailings deposits mixed with post-dumping sedimentary particles.

The physical properties and elements measured have a diagnostic character in differentiating the mine tailings from former deposits and from materials resulting from reworking after the cessation of dumping. Our results also provide clues on the seaward extension of the mine tailings deposit as shown by its seaward thinning recorded in the investigated sediment cores, which is a consequence of increasing distance from the discharge point on the shore and of waste dispersal and accumulation patterns in the shallow marine environment.