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REDUCING THE YIELD STRESS OF GRANULES PREPARED BY DRY ROUTE TO THE FABRICATION OF PORCELAIN TILES

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Traditionally granules produced by spray drying are used in the fabrication of ceramic tiles because they provide the uniform filling of the pressing moulds. The growing concern with energy and environmental issues in recent years has encouraged the search for other granulation processes that would require less energy and would be more environmentally friendly. In this context, studies were published in the last years, considering dry granulation as a promising alternative to substitute spray drying.

The main limitation of the dry granulation process is a consequence of the low plastic deformation of the granules produced by this route. The higher yield strength of the granules leads to higher water absorption, lower mechanical strength in the green and fired bodies.

The objectives of this study were to comparatively evaluate the mechanical behaviour of granules obtained by spray drying and dry granulation, during compaction and to look for adjustments of the dry granulation process that would produce granules with low yield stress.

Two granulated powders, with the same chemical and mineralogical compositions, typical of glazed porcelain tiles, were used – an industrial spray dried and a dry granulated powder. The size distribution, shape, flowability and mechanical behaviour during the compaction of the granules were evaluated. After that, the effects of the size, moisture content and presence of additives in the granules prepared by dry granulation were studied in order to determine its effects in the yield stress during compaction.

The results showed that the granules prepared by dry route in standard conditions present size distribution, shape and flowability similar to the spray dried granules. The increase in the moisture content and the presence of small amounts of lubricants contribute to reduce the yield stress of the dry granulated powders. The porcelain tiles obtained with these granules, using industrial pressing conditions, presented porosity and others technological properties similar to those obtained with spray dried powders. These results bring novel contributions to the feasibility of producing porcelain tiles by the dry route.