

X-RAY POWDER DIFFRACTION ANALYSIS OF PORTLAND-BASED CEMENTS FOR THEIR USE IN DENTISTRY

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A kind of cements commonly used in dentistry for endodontic purposes are known as mineral trioxide aggregate (MTA). Its composition are based basically on that formulated for type I Portland cement with the addition of bismuth oxide (for radio-opacity) and some small amount of calcium sulfate hydrated or not hydrated for controlling the set up time. The role of MTA as biomaterial is of fundamental importance in basic research because it seems to act in cell reactions stimulating the regeneration of mineralized tissue [1].

In a previous work [2] we have reported the composition (by Rietveld analysis) of the endodontic cement ProRoot MTA which is composed by bismuth oxide (19.8%), tricalcium silicate (51.9%), dicalcium silicate (23.2%), calcium dialuminate (3.8%) and calcium sulfate dehydrated (1.3%). The ferrite phase is not present (for aesthetic reasons, this cement must be almost white, not gray). At present, this cement is not available in Mexico and its use has been substituted by the cement known as Angelus MTA. Our study of a powdered sample of this cement by X-ray diffraction, reveals that it shows poorly crystallinity; it is based in type I Portland cement. The phases identified were: tricalcium silicate (ICSD 64759, PDF 16-406); dicalcium silicate (ICSD 280995, PDF 01-070-9857); dicalcium aluminate (ICSD 89708, PDF 01-070-3360); calcium sulfate hemihydrate (ICSD 24474, PDF 01-072-4535); and bismite (ICSD 15072, PDF 41-1449) for radio-opacity.

Analysis of the X-ray diffraction patterns of these kinds of materials; provide phase and crystal structure information of fundamental importance for understanding the physical and chemical properties of MTA.

References

1. C.B. Schultz, P. Westhauser, B. Niderost and W.G. Klaus. Retrograde obturation with MTA cement and Super-EBA after apicoectomy. Sealing ability of MTA and Super-EBA in dye penetration tests. *Schweiz Monatsschr. Zahnmed* 115 (2005) 442-454.
2. I.A. Belío-Reyes, L. Bucio, E. Cruz-Chávez. Phase composition of ProRoot mineral trioxide aggregate by X-ray powder diffraction. *J. Endod.* 35 (2009) 875-878.