Dynamic and Mechanical Properties of Calcium Borophosphate Glasses in Relation to Structure and Topology
Hermansen, Christian; Yue, Yuanzheng

Publication date:
2013

Document Version
Early version, also known as pre-print

Link to publication from Aalborg University

Citation for published version (APA):
Dynamic and Mechanical Properties of Calcium Borophosphate Glasses in Relation to Structure and Topology

C. Hermansen and Y.Z. Yue
Section of Chemistry, Aalborg University, DK-9000 Aalborg, Denmark
Email address of presenting author: chh@bio.aau.dk

Abstract
Calcium borophosphate glasses and glass ceramics are of interest as bone-replacement implants as they can bond to bone through an apatite layer, and dissolve in vitro at a rate comparable to the growth rate of natural bone. We investigate the pseudo-binary join between CaO·P₂O₅ and CaO·2B₂O₃ because both end-members form glasses and the CaO/P₂O₅ ratio (which is related to bioactivity) varies from unity to infinity across the join. We explore the composition and structure dependence of the glass transition temperature, kinetic fragility, indentation hardness, and glass stability. We also study the crystallization behavior of this glass series. The compositional variation of these properties is analyzed using the Phillips-Thorpe rigidity percolation paradigm and the temperature dependent constraint theory. This analysis gives insight into the link between properties and composition in borophosphate glasses.