# Abstract

Igneous cumulates and their parental intrusions are best known amongst geologist for their economical profitability as the main source of platinum group elements. However, beyond the scope of mining interests, cumulate rocks represent one of the most complicated and least understood topics in igneous petrology. Their formation is assumed to be driven by fractional crystallization of mostly mafic parental magmas, achieved by a separation of crystals from their surrounding liquid. In this work, I review the extend of current knowledge regarding the wide variety of possible formation processes, as well as the common properties and settings of cumulates and means of their classification.

In order to demonstrate the operation of the reviewed processes we carried out a series of high temperature experiments, investigating a behaviour of two different crystal suspensions over a period of 20 hours. Experiments were performed in a classic 1-atm. furnace at 1350 and 1390 °C, using a 10 wt. % and 60 wt. % mixtures of natural olivine and synthetic haplobasaltic glass. In a liquid rich environment, we observed a progressive formation of a cumulate layer by crystal settling, while in contrast, the suspension containing 60 wt. % of olivine effectively inhibited all movement aside from expansion of bubbles trapped inside the crystal mush. Textural analysis of all experimental samples revealed an effect of compositional convection, which enabled faster dissolution of small grains in the liquid-rich experiments, thus more rapid increase of the median grain size. Spatial distribution pattern of olivine crystals in both sample sets evolves from random to anti-clustered (i.e., ordered). This trend is more prominent in low crystallinity samples, where it is attributed to the effect of crystal redistribution. Our experiments provide qualitative record of mechanical and kinetic processes reported from the mafic cumulates worldwide.