

Glass stability of natural silicate compounds from igneous rocks

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The glass stability (GS) of natural silicate glasses, i.e. non-crystalline solids with compositions of igneous rocks, is poorly constrained. GS measures the resistance of a glass to crystallize when heated above its glass transition region. Using a differential scanning calorimeter (DSC), we have investigated six glassy starting materials with compositions variable from basalt (B_{100}) to rhyolite (R_{100}). In this range of compositions the DSC peaks related to T_g (glass transition), T_x (crystallization) and T_m (melting) temperatures become progressively less resolvable or even unidentifiable for the case of $B_{20}R_{80}$ and R_{100} . T_x markedly increases, whereas T_m decreases from B_{100} to $B_{40}R_{60}$ accounting for the crystallization of pyroxene, plagioclase and spinel. In contrast, $B_{20}R_{80}$ and R_{100} did not form any crystalline phase. The glass stability resulting from T_g , T_x and T_m linearly increases from B_{100} to $B_{40}R_{60}$. These parameters linearly scale with the glass-forming ability (GFA) of the compounds measured as the R_c (critical cooling rate) parameter.