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Limiting parameters for water milling alkali rich silicate glasses

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Processing and forming glass particles compacts is becoming increasingly important for the production of sintered glass-ceramics. For this purpose, the production of glass powders with fine and controlled particle diameters is mandatory and a routine in the development lab. Corrosion is one problem that arises when dealing with glass powders through the traditional aqueous ceramic technology. It is known that water molecules react breaking the silicon-oxygen bonds in silicate glasses. This is intensified in the case of alkaline silicate glasses due to lixiviation of alkaline ions from the glass surface, increasing the solution pH. Typically above pH 9 the solution becomes especially corrosive to the glass. Traditionally the glass corrosion is evaluated putting a monolithic or powder glass statically in water or a controlled solution. The amount of corrosion is measured by the solution pH and the kind and amount of dissolved ions as a function of time and temperature. In such experiments, it is very important to control the ratio of glass surface area to solution volume. The higher is this ratio, the faster the corrosiveness of the medium increases due to the increase of alkaline ions concentration. Under static conditions, an amorphous layer form on the surface of the glass, inhibiting further attach. However, when one processes glass powders in water in a ball mill, such static conditions is far for being the case. Additionally, the finer is the milled powder, the more surface is available for lixiviation. We review the fundamental parameters to be controlled to evaluate and minimize the corrosion of a commercial sodalime-silica glass under the dynamic conditions of a ball mill.