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Understanding and controlling scratch resistance in glasses is of great importance, as this can be one of the limiting factors in glass applications. Thanks in part to the wide use of glasses that humans interact with, such as the screens for portable/smart electronic devices, resistance to scratch induced damage has become a primary concern. Previous studies have shown that glasses dissipate energy on smaller scales partially through densification, shear flow and cracking. In this study, we focus on the scratch resistance of a family of Calcium Aluminosilicate (CAS) glasses whose composition follows xCaO+xAl O +(100-2x)SiO, where 'x' is in mol%. We performed a series of instrumented scratch tests on the nano scale using a conospherical probe. The scratch hardness (Hs) was obtained by dividing the work of lateral deformation by the total deformed volume. In addition, an Atomic Force Microscope was used to map the surface after the elastic deformation was recovered. Although Hs did not exhibit a significant evolution with respect to SiO content, the energy dissipated by inelastic mechanisms showed a strong compositional dependency, also evidenced by pile-up volumes and changes in the depth of the scratch trough AFM scans.