Research Project no. MSMC12 (Area: Molecular Systems and Materials Chemistry)

Minimum duration of the research internship: 5 months

Surface strengthened glass-ceramics

Prof. Luis F. Santos

E-mail: luis.santos@tecnico.ulisboa.pt

Gorilla® Glass (a trademark of Corning Inc., Corning, NY) is mostly used in portable electronic devices such as mobile phones or portable computer monitors. This is due to its improved mechanical strength, obtained by an ion exchange process, resulting also in high resistance to wear and scratch.[1] But in daily use, Gorilla® Glass screens can be easily scratched if dropped or exposed to sand or dust. Moreover, Gorilla® Glass screens can be scratched as a result of friction caused by keeping the phone into one´s pockets together with coins, keys and other items. Today, many people use protective films on the screens to avoid scratches, but at the cost of reduced brightness and poor sense of touch. On the other hand, high mechanical strength glass can enable the use of lighter glasses in cars and airplanes, allowing superior performance with economies of scale in terms of fuel with benefits for governments and consumers.

The mechanical properties of glass ceramics (GCs) are generally superior to those of the original glass and traditional ceramics, while making possible to obtain complex shapes using common glass forming processes. Therefore, the combination of a GC with the ion exchange process is expected to yield an improved material.[2] On the other hand, as an alternative to the preparation of a bulk GC by volume crystallization,[3] it is also proposed to create a GC layer on the surface of the original glass, which will cause a reinforcement of the surface mechanical strength. In this work, we will try to develop a glass ceramic with improved mechanical properties, thus allowing obtaining a thinner and lighter glass ceramic to be used not only in smartphones and tablets but that can bring fuel economy to the automotive and space industries. This work combines GC preparation and strengthening by different processes, in order to obtain a surface engineered GC with improved mechanical strength.

References

1. https://www.corning.com/gorillaglass/worldwide/en/technology/how-it-s-made.html. Accessed in 28/09/2018
2. R. Gy, *Mater. Sci. Eng. B* **2008**, *149*, 159-165.
3. R. Santos, L. F. Santos, R. M. Almeida, J. Deubener, L. Wondraczek *J. Solid State Chem.* **2010**, *183*, 128-135.