

The Center for Research, Teaching, and Innovation in Glass (CEPIV) aims at mapping the glass “genome” and developing new active glasses and glass-ceramics with promising applications through fundamental research on structure-property relations using complementary simulation, spectroscopic and functional characterization methods. The core group of the Center consists of 14 researchers at the Federal University of São Carlos (UFSCar) and the University of São Paulo (USP) – São Carlos campus – experts in engineering, chemistry and physics of vitreous materials, glass crystallization and a wide range of structural and functional characterization techniques. They supervise approximately 50 post-docs and students engaged in glass and glass-ceramics research and are embedded in a large Brazilian and international network of collaborations.

CEPIV will research and develop new glasses and glass-ceramics presenting new or improved functionality, such as high mechanical strength and electrical conductivity, biological, optical or catalytic activity, and/or combinations of these properties. A fundamental understanding of these properties will be sought based on the structural organization of these materials on different length scales. The center will apply state-of-the-art NMR, EPR, EXAFS and vibrational spectroscopy to characterize local and medium-range order, as well as the full resolution range of optical and electron microscopes, XRD and microanalyses for elucidating nano and microstructures. Molecular dynamics simulations will complement this comprehensive experimental approach. Using this experimental modeling strategy, the RIDC will further seek a fundamental understanding of glass sintering and crystallization in terms of mechanisms, thermodynamics and kinetics of viscous flow, as well as crystal nucleation and growth, enabling the Center to exercise control of these processes

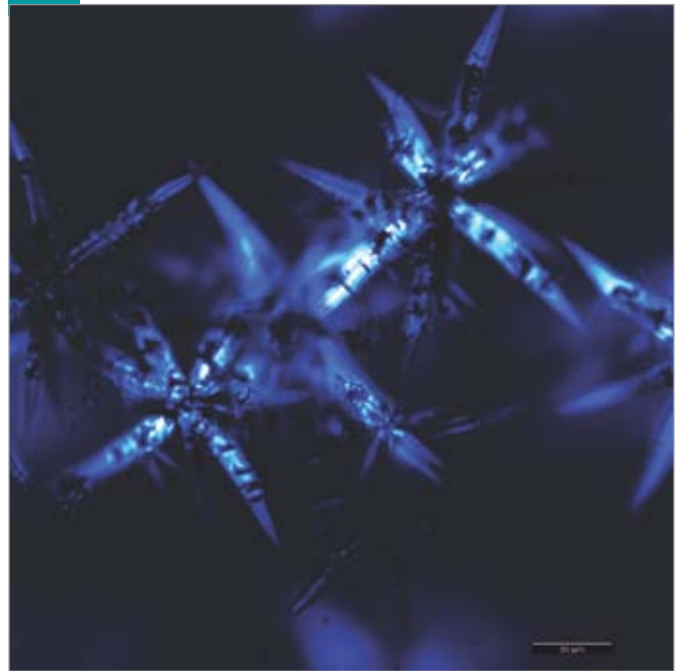


Photo by Vladimir Fokin

*Orchid-like crystals in the interior of CaO-Li<sub>2</sub>O-SiO<sub>2</sub> glass. The crystals are microcracked due to thermal expansion mismatch with the residual glass phase. Polarized optical microscopy.*

*E.D. Zanotto. Cristais em vidros - Ciência e Arte. EdUFSCar, 124 pags. Dez. 2011.*

by developing appropriate forming process and thermal treatment protocols.

In a concerted effort, the participating laboratories will jointly investigate a number of important benchmark systems, which are deemed particularly promising for applications either as structural reinforcement materials (dental and bioglass-ceramics), optical materials (laser glasses), materials for electrochemical energy storage devices (electrolytes high-temperature seals), and catalytically active systems.

This research agenda will be complemented by continuous education and outreach activities at different levels, as well as by technology development and transfer.

**Host Institution**

Federal University of São Carlos (UFSCar)

**Associated Institution**

University of São Paulo (USP)

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