LASER COLOURING OF GLASSES BY WAY OF SILVER ION EXCHANGE METHODS.

Abel Puche Roig, Vicent Primo Martín, Sonia Murcia Mascarós, Rafael Ibáñez Puchades
Instituto de Ciencia de los Materiales - Universidad de Valencia, Postal Box 22085, 46071, Paterna, Spain
abel.puche@uv.es

Ion exchange methods have been extensively used already from antiquity to obtain mainly yellow and red tones by way of procedures that included Ag and Cu salts, clays and natural oils. [1] The glass was coated by this blend and heated close to the softening temperature under a reducing atmosphere so that the ion exchange could be achieved and the metallic elements reduced to its elemental state. [2, 3] These metallic particles are actually in form of nanoagregates, which are origin of the interference phenomena responsible of the colours. [4, 5]

We have improved the method to exchange silver in glasses by fine tuning all the parameters involved: size and distribution of the clays, thermal treatment, silver salt concentration, etc. Therefore we have been able to control the ion-exchange method and after that generate colour in glasses by way of a thermal laser (CO_2 laser). Significant differences have been observed between the colours obtained by laser and by furnace heating.

References:

[1] José María Fernández Navarro, El Vidrio, CSIC, 3ª edición, 2003.
[2] Satoshi Takeda, Kiyoshi Yamamoto, Kiyoshi Matsumoto, Journal of Non-Crystalline Solids, **265** (2000), 133-142.
[3] J.E. Shelby, J. Vitko Jr., Journal of Non-Crystalline Solids, **50** (1982), 107-117.
[4]T.P. Seward, III, Journal of Non-Crystalline Solids, **40** (1980), 499-513.
[5] A. Miotello, G. De Marchi, G. Mattei, P. Mazzoldi, A. Quaranta, Applied Physics A, **70** (2000), 415-419.