# The Geologic History of Quartz Grains, as Revealed by Color SEM-CL

**John N. Hooker and Stephen E. Laubach**

Jackson School of Geosciences, The University of Texas at Austin,
University Station, Box X, Austin, Texas 78713-8924

## ABSTRACT

**This study is a combination of scanning electron microscope-cathodoluminescence (SEM-CL) color and texture information from 530 quartz grains from gneisses, sandstones, igneous rocks, and natural sand samples. Color is measured from images taken through red, green, and blue filters; each quartz grain is then characterized as *red*, *purple*, *blue*, or *dark*. Subdividing these categories by what textures are present in each grain yields information about the geologic history of each grain that is not accessible using conventional microscopy or separate SEM-CL color and texture. Textureless grains are interpreted as low-grade- or contact-metamorphic if *red* and igneous if *blue*. *Dark* grains are interpreted as recycled authigenic quartz. Gneissic grains are invariably mottled and *purple* with sealed microfractures whose relative brightness varies with metamorphic grade. *Blue* grains show the most variation in texture; they may feature mottling, various types of microfractures, and CL-dark spots of consistent size (~5 µm) and density. Examination of samples from the Lewisian Gneiss and the Torridonian Supergroup from northwest Scotland supports previous studies that showed the Torridonian Supergroup's source rock was primarily gneissic initially, but became more varied over time. The method reveals that a sand sample from the shore of Loch Tarbhajdh was sourced primarily from the Torridon Group and not the Lewisian Gneiss. This paper also presents the examination of Gulf of Mexico sandstones (from the La Boca Formation and the Lower Wilcox Group) and a natural sand sample from Galveston Island. This study's results are compared with those using conventional provenance methods.**