CATHODOLUMINESCENCE AND RAMAN STUDIES OF IMPACT GLASSES. A. Gucsik[1], C. Koeberl[1], F. Brandstätter[2] and E. Libowitzky[3], [1]Department of Geological Sciences, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria (christian.koeberl@univie.ac.at), [2]Natural History Museum, P.O. Box 417, A-1013 Vienna, Austria; [3]Institute of Mineralogy and Crystallography, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria.

Introduction: Impact glasses have been studied in the past with a variety of physical and chemical methods, but it seems that there are few, if any, cathodoluminescence (CL) studies so far. To attempt a first study of the CL properties of impact glasses (including CL imaging and CL spectroscopy) we selected three samples: an Aouelloul impact glass, a Libyan Desert Glass, and a Muong Nong-type indochinite (tektite). The CL studies are supplemented by micro-Raman spectroscopy and infrared reflectance spectrometry, as well as compositional studies using electron microbeam techniques.

Results: The back-scattered electron (BSE) and CL images of the Muong Nong-type tektite are relatively featureless and show little variation (apart from a few BSE-bright inclusions, which also appear in the CL image). Also, the BSE image of the Libyan Desert Glass shows only limited brightness contrasts. For the Aouelloul glass, both BSE and CL images show distinct brightness contrast, and the CL images for the Libyan Desert Glass show spectacular flow textures that are not visible in any other microscopic method. All three glass types show an inverse relationship between BSE and CL intensities, which seems to be related to the presence of activators, such as Al, Li, Na, Fe, which might cause quenching of the CL signal. The Energy-Dispersive X-ray (EDX) compositional data show that the SiO_2 composition is relatively higher and the Al_2O_3 content is lower in the CL-bright areas than in the CL-dark regions. The CL images seem to preserve remnants of the texture of the target rock that was melted to produce the impact glass. The tektite has a homogeneous appearance in both BSE and CL images, indicating that it was subjected to a high temperature; the Aouelloul impact glass preserves remnants of a texture in both BSE and CL images, indicating a relatively low formation temperature, and the Libyan Desert Glass preserves a flow texture that is only visible in the CL images, indicating a medium temperature.

Broad bands at 491 and 821 cm^{-1} in the Raman spectra in all samples might be associated with remnants of diaplectic glass, indicating early shock amorphization followed by thermal amorphization. The observed two broad bands at 332 (3.73 eV), 390 (3.17 eV) and around 440 (2.79 eV) nm in the cathodoluminescence spectra of the impact glass samples might be related to the presence of defect centers in the slightly distorted SiO_4 tetrahedra. This multi-technique approach, including BSE and CL imaging, combined with IR, CL and Raman spectroscopy, has the potential to be a powerful tool that can be used to characterize the internal heterogeneities and structure of impact glasses. In particular, the CL images of Libyan Desert Glass show a variety of structure that has not been recognized before.