MAS-NMR Studies of Glasses and Glass-Ceramics based on Clinopyroxene–Fluorapatite System

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Supplementary Material Figure Captions

Supp. Mat. Fig. 1. Illustration from software of SEM-EDS analysis for DJ1.

Supp. Mat. Fig. 2. DSC for DJ0.

Supp. Mat. Fig. 3. DSC for DJ1.

Supp. Mat. Fig. 4. DSC for DJ2.

Supp. Mat. Fig. 5. DSC for DJ3.

Supp. Mat. Fig. 6. DSC for DJ4.

Supp. Mat. Fig. 7. DSC for DJ5.

Supp. Mat. Fig. 8. ^{19}F MAS-NMR of glasses DJ0 (top) DJ1, DJ4 and DJ5 (bottom). This shows mixed sites of F-Ca(n) and F-Mg(n).

Supp. Mat. Fig. 9. The d values of the principal reflection d(-2,2,1) from the XRD powder pattern of the Di-Jd solid solutions. The diamonds are the data for the Di-Jd solid solutions under high pressures[58] taken from the American Mineralogist Data Base (http://rruff.geo.arizona.edu/AMS/amcsd.php). The line connects d values for pure Jd and Di and represents linear change from one lattice to another. Up triangles are the data from this work obtained at normal atmospheric pressure. It is seen that the ambient data follow the same trend as the compressed minerals.

Supp. Mat. Fig. 10. Deconvolution of ^{29}Si NMR spectra of crystalline DJ5 composition with 120s (a) and 1s (b) relaxation delay. 5 Hz line broadening was used in both cases.
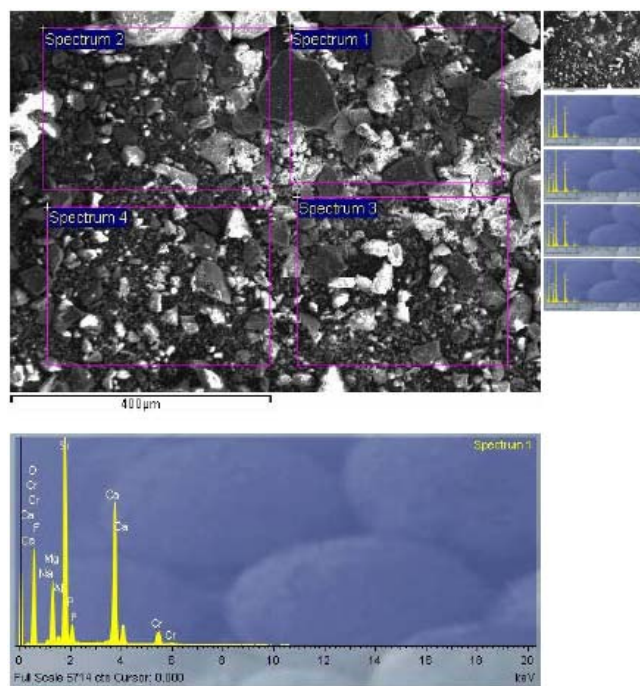
Supp. Mat. Fig. 11. SEM for DJ0.

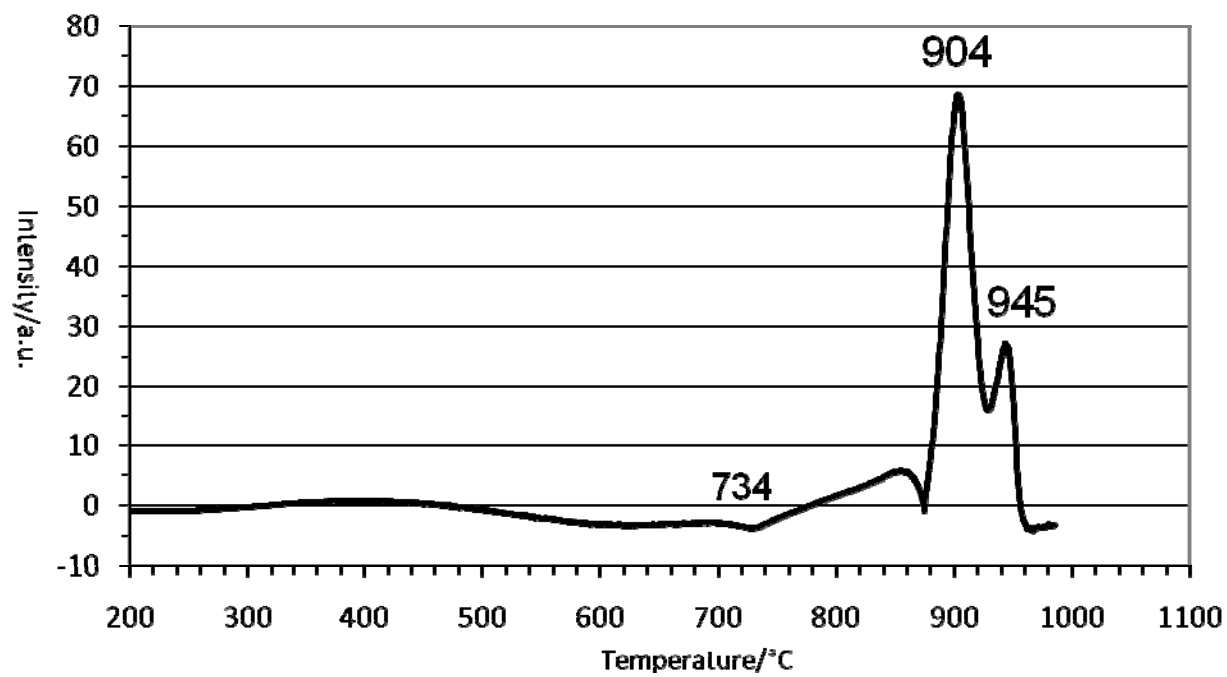Supp. Mat. Fig. 12. SEM for DJ1.

Supp. Mat. Fig. 13. SEM for DJ3.

Supp. Mat. Fig. 14. SEM for DJ5.

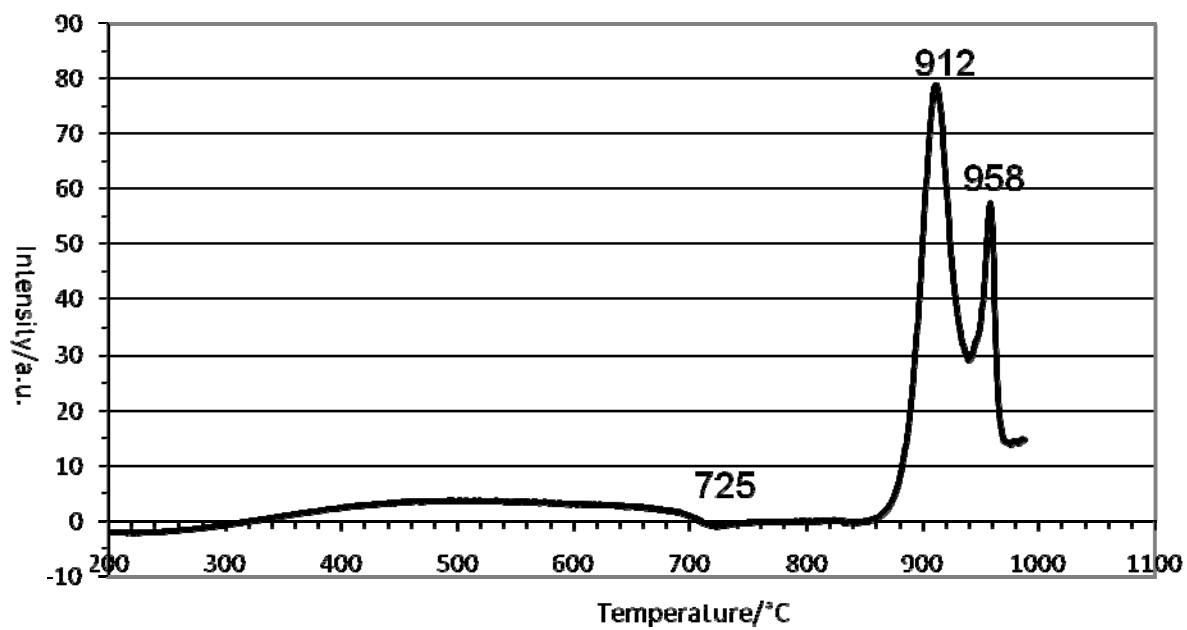**Supplementary Material Figures**

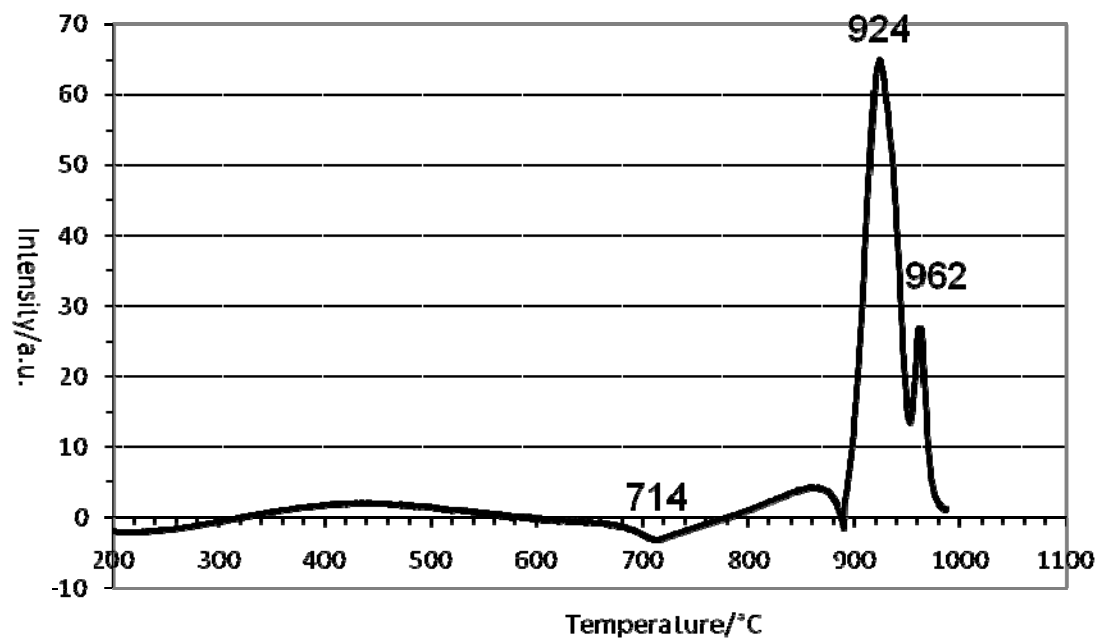Supp. Mat. Fig. 1. Illustration from software of SEM-EDS analysis for DJ1.
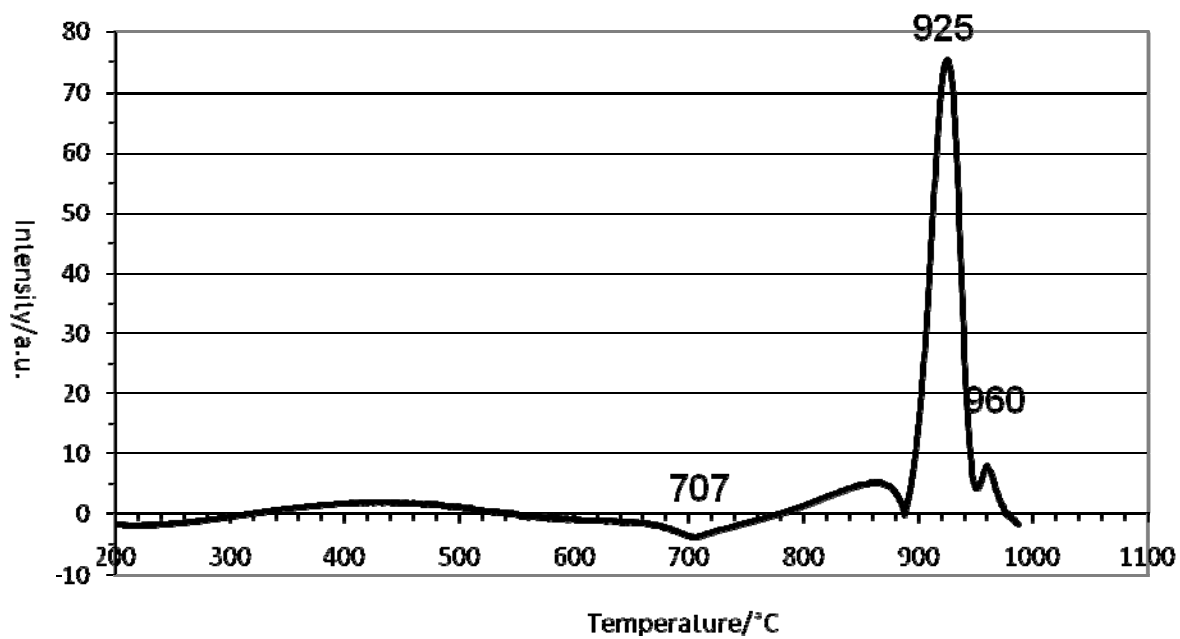
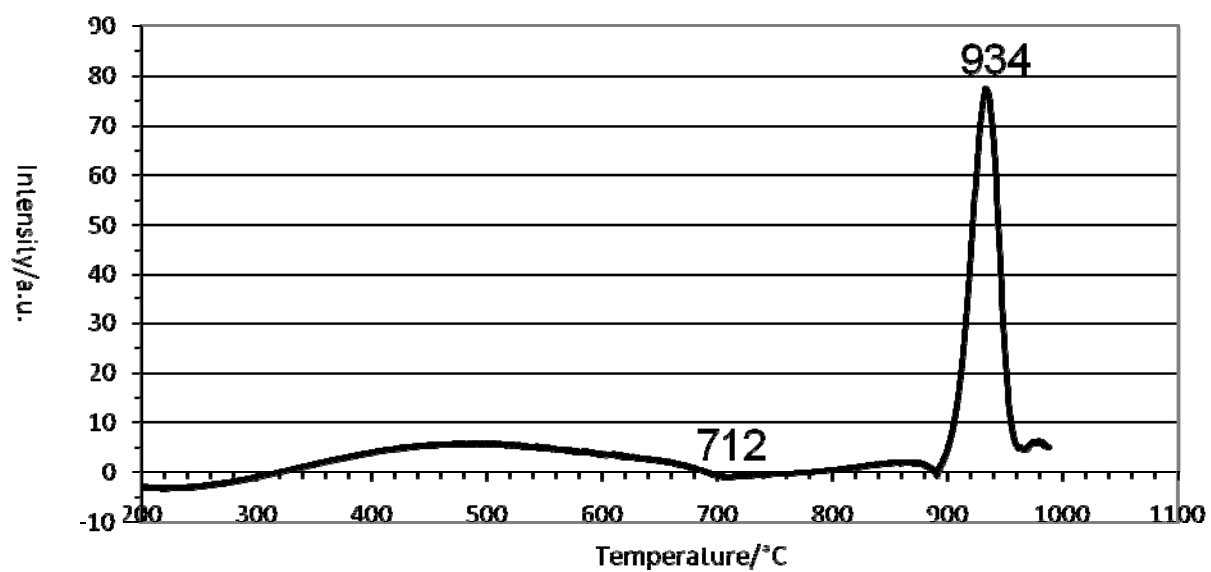Supp. Mat. Fig. 2. DSC for DJ0.

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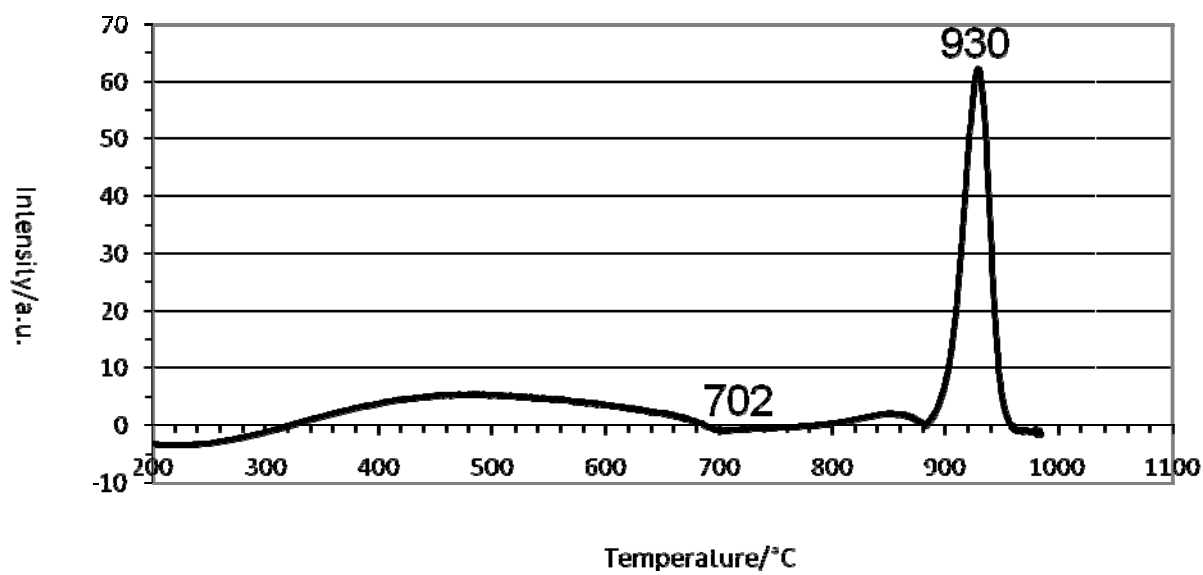
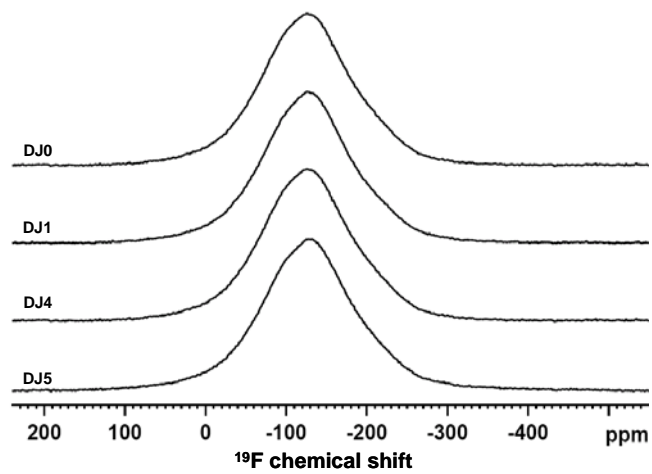Supp. Mat. Fig. 4. DSC for DJ2.

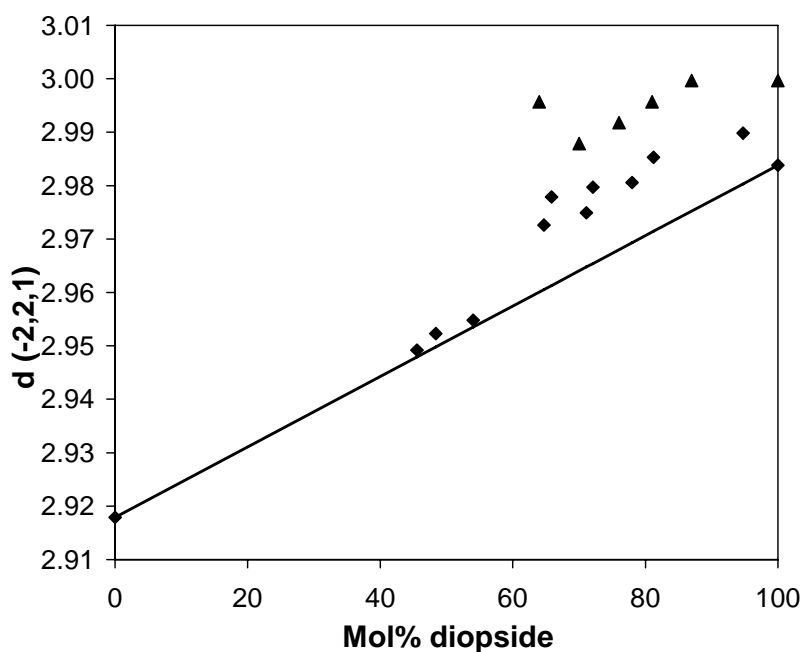Supp. Mat. Fig. 5. DSC for DJ3.

Supp. Mat. Fig. 6. DSC for DJ4.

Supp. Mat. Fig. 7. DSC for DJ5.

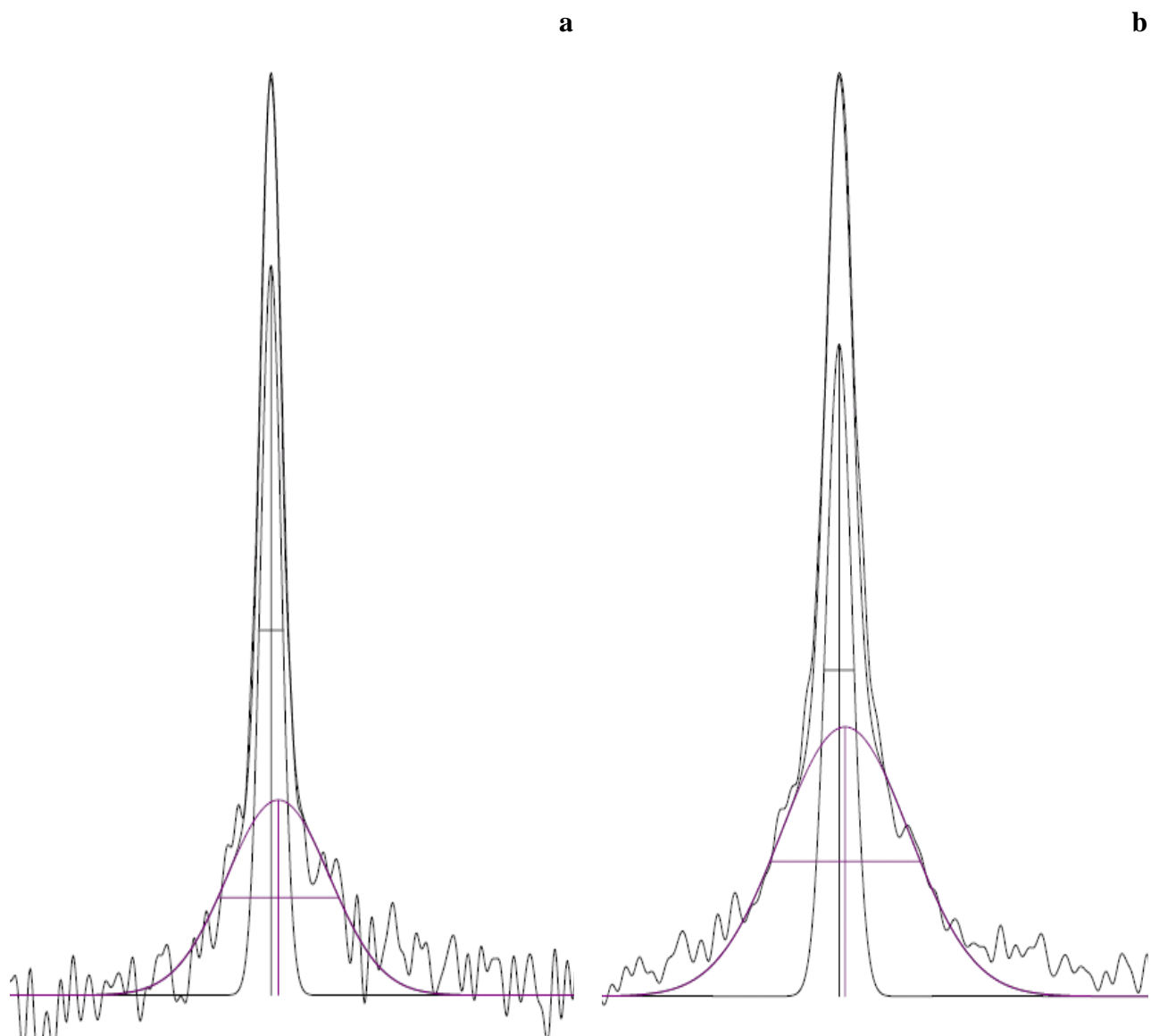Supp. Mat. Fig. 8. ^{19}F MAS-NMR of glasses DJ0 (top) DJ1, DJ4 and DJ5 (bottom). This

shows mixed sites of F-Ca(n) and F-Mg(n).

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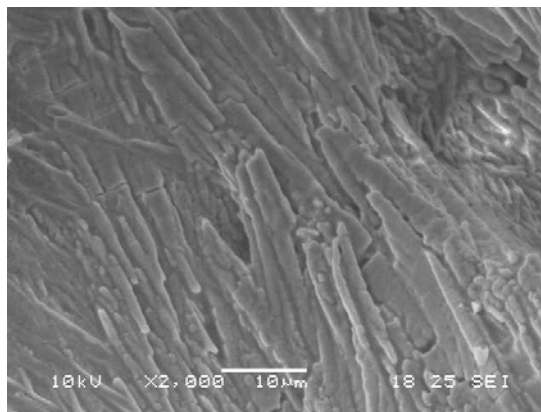**a**   **b**
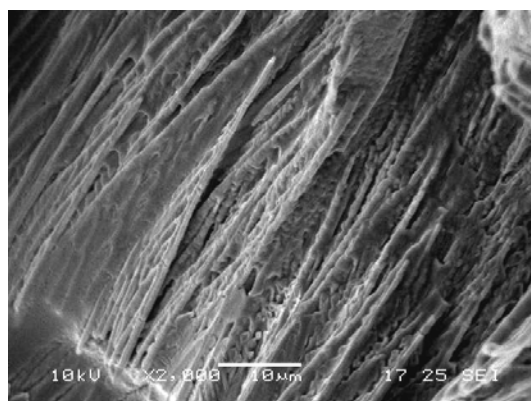
SEM Micrographs

The internal microstructures of the of the obtained glass-ceramics materials were examined by using scanning electron microscopy (SEM), where electron micrographs of representative samples were obtained using a Joel, 5610LV scanning electron microscope. The scale bar represents 10μm.

The SEM micrographs show the formation of crystalline regions. It also appears that going from DJ0 to DJ5 that the crystallinity decreases.
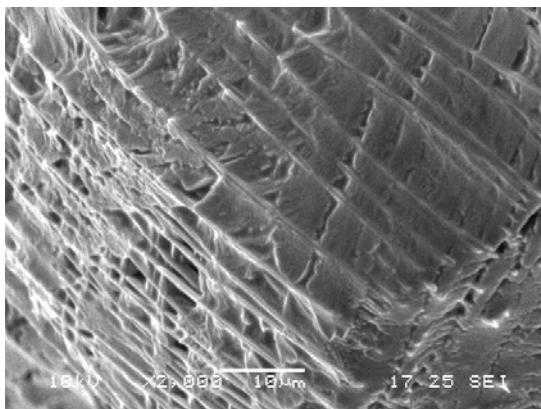
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