Broadband dielectric spectroscopy of muscovite and biotite micas at elevated temperatures

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The unique physico-chemical, electrical, mechanical and thermal properties of micas make them suitable for a wide range of industrial applications and thus the scientific interest for this kind of hydrous aluminosilicate minerals is still persistent [1]. In the present work, broadband dielectric spectroscopy measurements over a broad frequency range (10mHz - 1MHz) and at elevated temperatures (423K - 1373K) were carried out in muscovite and biotite micas, perpendicular to their cleavage planes. Different formalisms of data representation were used (Cole-Cole plots of complex impedance, complex electrical conductivity and electric modulus) to analyze the electrical behavior of micas and its correlation with the dehydroxylation process (Fig. 1). The electrical conductivity is strongly affected by the different concentrations of Fe and Ti and low estimated activation energies suggest proton and/or polaron conduction due to bound water and different oxidation states of Fe, respectively.

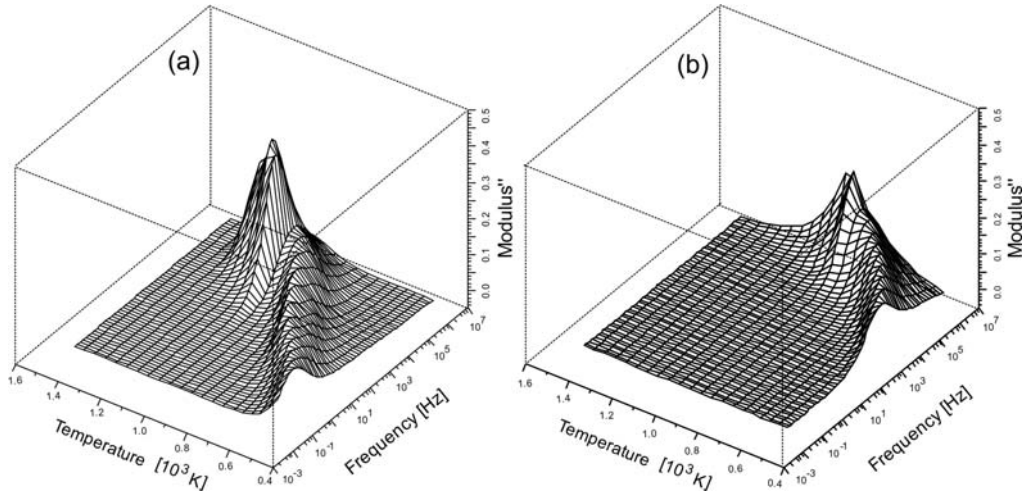

Figure 1: 3D-plane plots of imaginary part of electric modulus (M'') as a function of frequency and temperature up to 1373K for (a) muscovite and (b) biotite mica.

References

[1] Fleet, Rock-Forming Minerals: micas, Vol. **3A**, 2nd ed. (2002).

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