

NEXAFS Characterization of Poly(acrylic acid) - Clay Interactions

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Experiments:

The powder samples of the poly(acrylic acid) - clay nanocomposites and the standard references have been mounted using Cu double sided tape. Several NEXAFS measurements were carried out for the O *K*-edge, Fe *L*-edge, Al *K*-edge and Mg *K*-edge, which are the main elements of the layered silicate. The Si *L*-edge signals were unable to acquire. The adsorption signals were collected via the fluorescence yield detector recently developed. The total yield electron mode was not available

Preliminary analysis of the O K-edge NEXAFS for the nanocomposites formed by natural clay and synthetic clay and poly(acrylic acid):

For the O *K*-edge NEXAFS of the natural clay montmorillonite (Fig 1), the significance remained in the sharp features at the energy range lower than 535 eV. This feature may provide information regarding the chemical adsorption of the polymer chain on the silicate

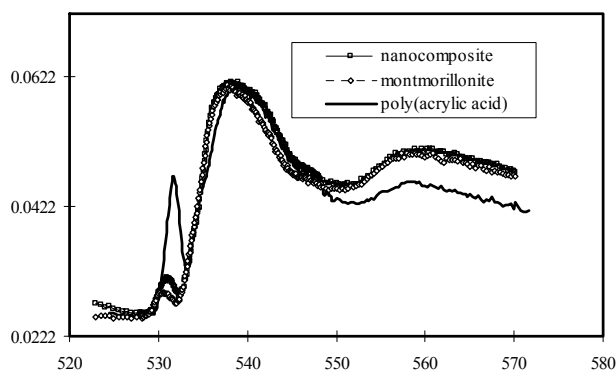


Figure 1. Normalized O *K*-edge NEXAFS of the poly(acrylic acid) - montmorillonite nanocomposite and reference standards

surface. Information from NEXAFS measurements is complementary to the laboratory - based X-ray photoemission spectroscopy results, previously performed for these materials (Tran et al *J Colloid and Interface Science*, 2005, 390, 392)

Figure 2 shows the O *K*-edge NEXAFS of the nanocomposite formed by the synthetic clay and poly(acrylic acid) and the reference standard. In comparison, the treatment of synthetic clay by poly(acrylic acid) resulted in modification of the silicon tetrahedral environment, ie from silicate (Si-O-M) to silica (Si-O-Si). This has been confirmed by the laboratory - based XPS, FTIR and Si solid state NMR spectroscopy data.

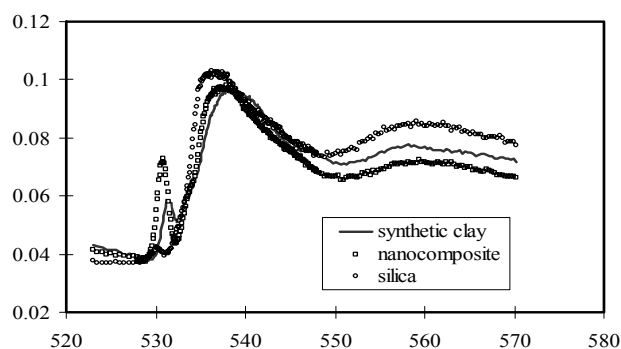


Figure 2. Normalized O *K*-edge NEXAFS of the poly(acrylic acid) – synthetic clay nanocomposite and reference standards including SiO₂

These O *K*-edge data are now combined with the Fe *L*-edge, Mg *K*-edge and Al *K*-edge NEXAFS, in attempts to study the influences of the short-range structural order to the long- range order of the nanocomposites.