Creep Tests

Creep tests are shown in Figure 1. Strain was plotted against time at different temperatures. According to the Voigt model, the strain ($\gamma$) can be given by the following equation (1):

$$\gamma = \left(\frac{\sigma_0}{E}\right) (1 - \exp(-t/\lambda)) \quad ...(1)$$

Where $E$ is the Young's modulus of the material, $\sigma_0$ is the stress at $t = \infty$ and $\lambda$ is the retardation time. The Arrhenius expression for temperature dependence of retardation time is given by:

$$1/\lambda = A \exp(-E_a/RT) \quad ...(2)$$

Where $A$ is a constant, $T$ is temperature, $R$ is the gas constant and $E_a$ is the activation energy. The insert in figure 1 shows the Arrhenius plot used to calculate the activation energy of the process. The apparent activation energy obtained is 2.6 kcal/mol (10.6 kJ/mol)

**Figure 1. Representative creep test of BC gels.** Creep tests were performed on BC gels at temperatures ranging 0-30 °C. A Voigt model was used to find the retardation time at each temperature. The Insert shows the Arrhenius plots of the retardation times of BC against the reciprocal of absolute temperature.