

High Thermal Resistance of Epoxy/Cyanate Ester Hybrids Incorporating an Inorganic Double-Decker-Shaped Polyhedral Silsesquioxane Nanomaterial

Characterization

^1H spectra were recorded on a INOVA 500 MHz NMR spectrometer, with CDCl_3-d as an external standard. The IR spectra were measured with a Bruker Tensor 27 FTIR spectrophotometer using the conventional crystal KBr disk method. 32 scans were collected at a spectral resolution of 4 cm^{-1} . Dynamic mechanical behavior of cured sample was studied using a Du-Pont 2980 dynamic mechanical analyzer. Cured sample was polished to $\approx 3.0 \times 13.0 \times 30.0\text{ mm}$ and mounted on a single cantilever clamp. The mechanical properties were measured under nitrogen in step mode every $5\text{ }^\circ\text{C}$ from 25 to $350\text{ }^\circ\text{C}$ at frequency of 1 Hz . The thermal stability of the samples was characterized by using a TA Q-50 Thermogravimetric Analyzer operating under a nitrogen atmosphere. The cured sample ca. 7 mg was placed in a Pt cell and heated at a rate of $20\text{ }^\circ\text{C}/\text{min}$ from 30 to $800\text{ }^\circ\text{C}$ at a nitrogen flow rate of $60\text{ mL}/\text{min}$. The dynamic curing kinetics was studied using a TA Q-20 instrument Differential Scanning Calorimeter operating under a nitrogen atmosphere. The sample (ca. 7 mg) was placed in a sealed aluminum sample pan. Dynamic curing scan were conducted from $30\text{ }^\circ\text{C}$ to $350\text{ }^\circ\text{C}$ at a heating rate of $20\text{ }^\circ\text{C}/\text{min}$.

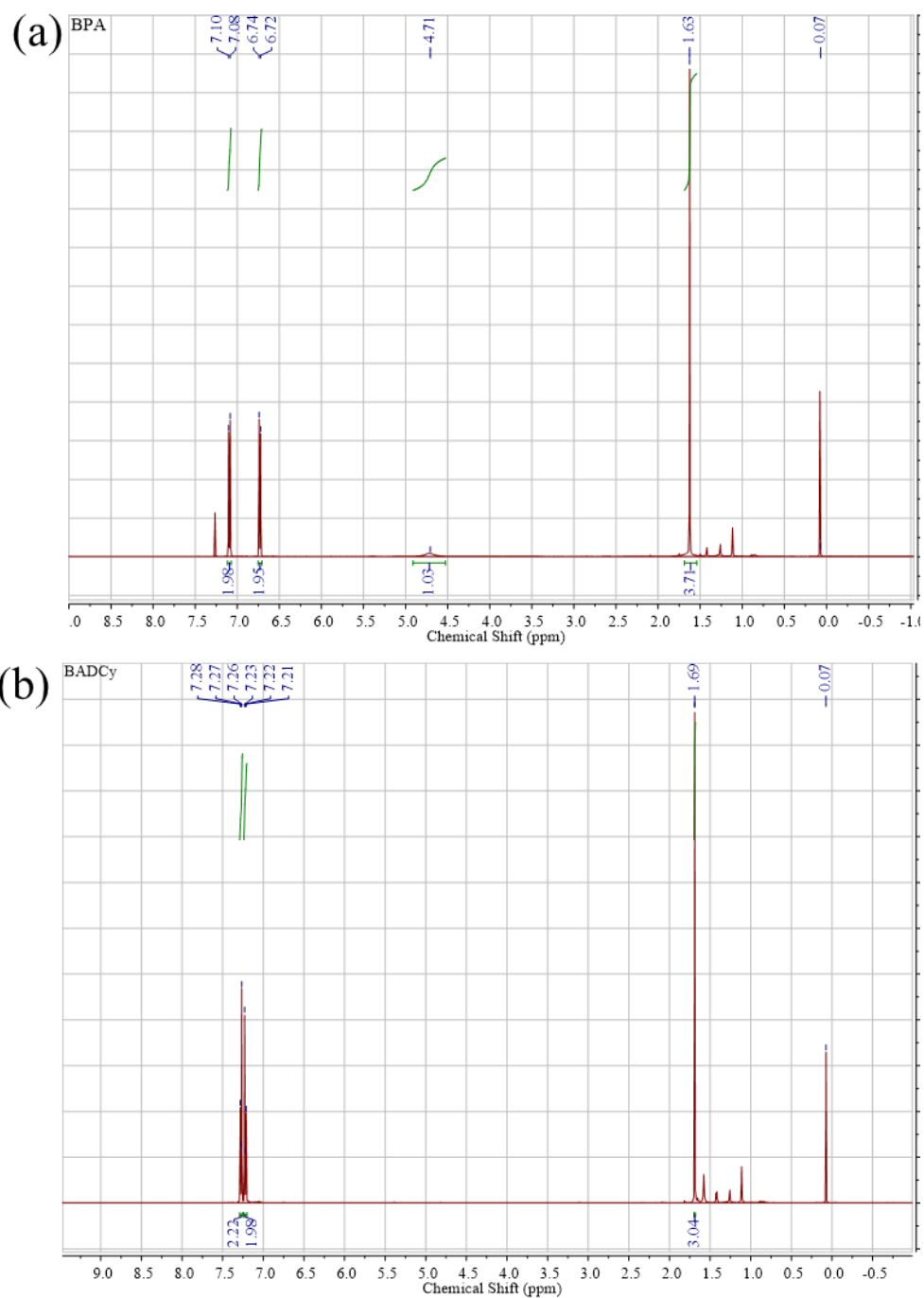


Figure S1. ^1H NMR spectra of (a) BPA and (b) BADCy monomer.

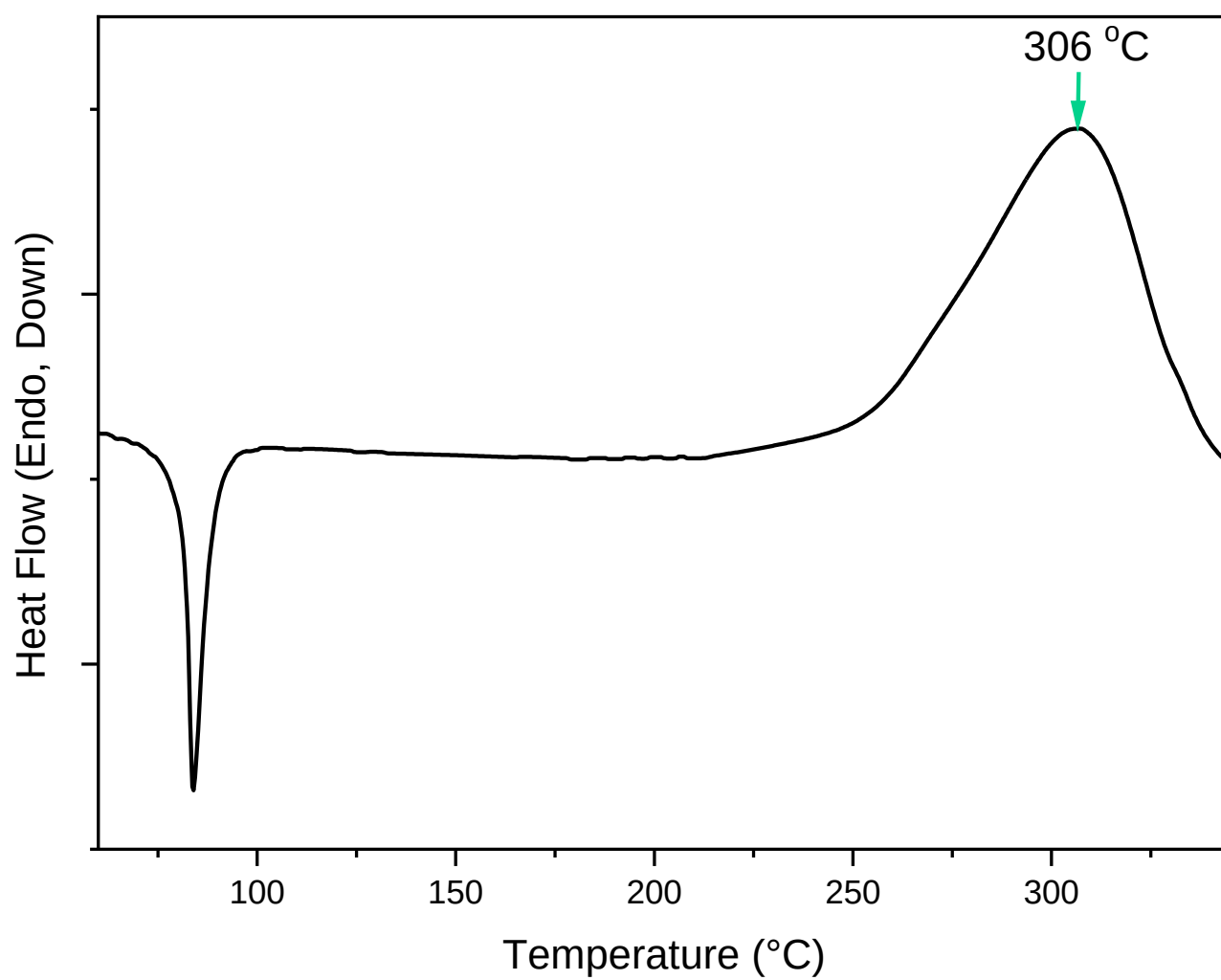


Figure S2. DSC thermal analysis of pure BADCy under first heating scan .