

Characterization of Polyvinylcarbazole by SEC with MALS

Polyvinylcarbazole (PVK) is a photovoltaic polymer, which means that the bulk polymer—after being exposed to visible or ultraviolet light—becomes an electrical conductor. PVK is used in multilayer light-emitting devices to increase the transporting layer which improves the efficiency of the device. It also finds uses in xerography and other electro-optical applications.

For the application of polymer materials containing PVK, the knowledge of its molecular weight and its molecular weight distribution (MWD) is of principal importance. Size-exclusion chromatography (SEC) was chosen for the analyses of the PVK samples. As PVK is a rather unusual polymer, with no calibration reference standards, the light-scattering detection was necessary to make possible the calibration of the separation system by the on-line detection of molecular weight.

For the analysis described in this application note, the DAWN-DSP multiangle light scattering (MALS) was connected to an SEC system working with tetrahydrofuran (THF) as the mobile phase. The analysis revealed that calibration was linear in the range of two orders of magnitude (Fig. 1) even when the MWD is not terribly broad ($M_w/M_n=2.234$, $M_w=1.392 \times 10^5$).

The cumulative MWD constructed from the light-scattering and differential refractive index (RI) data (Fig. 2) makes it possible to find the fraction (between 0 and 1) of the material with molecular weight lower than the abscissa of the particular point on the cumulative MWD and subsequently modify further processing of the PVK samples intended for electro-optical applications.

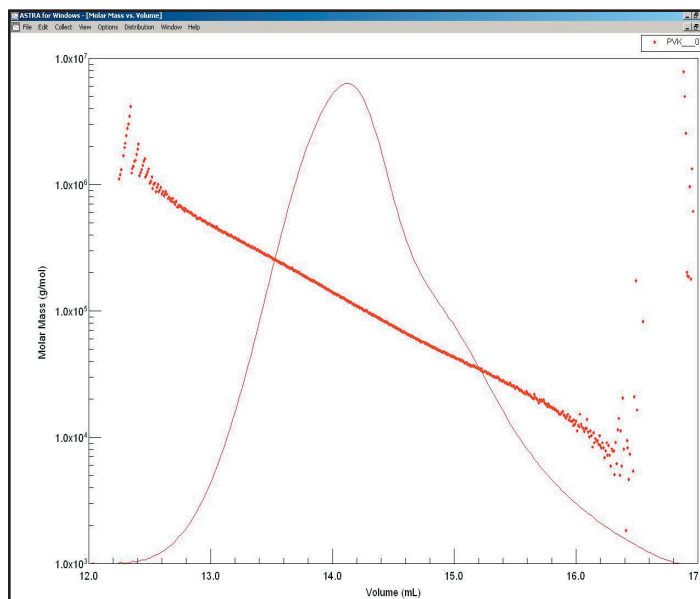


Figure 1. Comparison of the calibration dependence constructed from the MALS-RI detection data for the PVK sample with RI signal showing the range of the calibration of the separation system.

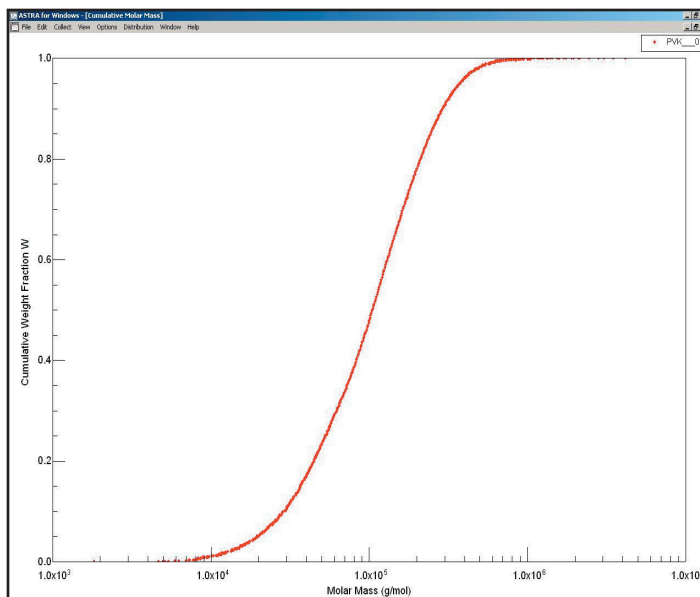
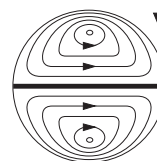


Figure 2. Cumulative MWD constructed from the MALS-RI detection data for the PVK sample.

This note graciously submitted by Milos Netopilik, Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic.



**Wyatt
Technology**
CORPORATION
6300 Hollister Avenue • Santa Barbara, CA 93117
TEL (805) 681-9009 • FAX (805) 681-0123
E-mail: info@wyatt.com • URL <http://www.wyatt.com>