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4th World Congress on

CHROMATOGRAPHY

August 07-09, 2017 | Rome, Italy

Gas chromatography: A novel and new technique for on-line cure monitoring studies of carbon-phenolic composite structures

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We report the use of gas chromatography technique for on-line cure monitoring of the carbon-phenolic(C-P) composites to identify the gelation region for pressure application to enhance the thermal performance. Experimental trials are made on the laminates prepared by hand lay-up process in autoclave. During curing process methylol-phenol (M-phenol) and water are evolved as reaction by-products and the concentrations of the evolved byproducts are monitored by on-line gas chromatograph connected to autoclave facility. Experimental parameters like sample injection method, sample volume and time of injection have been optimized and m-phenol and water evolution concentrations are monitored as a function of component temperature. M-phenol evolution is more consistent compared to water evolution and therefore based on the falling trend of the methylol phenol concentration a broad region of gelation for pressure application is identified. The region thus identified is further narrowed down based on the diminishing trend of the M-phenol concentration and the experimental analysis of the laminates focusing on resin content and void content. Finally the on-line pressure application criterion was established based on the resin content and void content data. Based on the resin content and the low void content the performance of the C-P structure is evaluated.

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Efficient HPLC enantiomer separation using novel homo chiral metal-organic frameworks as chiral stationary phases

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Porous metal-organic frameworks (MOFs) have attracted much attention in the last decade because they can be used for various potential applications such as gas storage, separation, sensing, and catalysis. Recently, MOFs have been considered as separation materials for chromatography owing to their high surface area, uniform structural cavities, outstanding thermal and chemical stability, and selective adsorption phenomena. To date, a number of chiral MOFs have been developed and synthesized. Chiral MOFs have great potential as chiral stationary phases (CSPs) for HPLC enantioseparation of racemic compounds. However, there are only a few attempts of chiral MOFs being used in liquid chromatographic enantioseparation; most of which exhibited a relatively narrow range of chiral enantioselectivity. Herein, we report novel homochiral pillared MOFs (1, 2) with excellent selectivity for HPLC enantiomeric separation of various racemates such as sulfoxides, sec-alcohols and flavanones. The racemates of sec-alcohols were well separated on both the MOF-1 and MOF-2 columns. The separation factors () were also larger for p-substituted derivatives than for their o- and m-substituted counterparts, which is most likely because of steric constraints. Interestingly, the introduction of electron-withdrawing substituents on the aromatic ring gave rise to a prominent base-line separation of enantiomers as shown in Figure 1. The π - π interactions between the N-donor linker of the framework and electron-deficient aromatic group of compound may be one of reasons.

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