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FLAMMABILITY OF PETROLEUM BASED HYDRAULIC FLUIDS

Hydraulic fluids, for the most part, are considered to be much less flammable than middle distillate fuels. Petroleum based hydraulic fluids have high flash points while water based hydraulic fluids, because of the high water content, are definitely non-flammable. The major problem with water based hydraulic fluids is corrosion. Petroleum based fluids are much less corrosive and thus, equipment lifetime is considerably increased. However, some petroleum-based hydraulic fluids have been observed to be a fire safety hazard in situations where high-pressure leaks can result in aerosol formation. These fire hazards cannot be adequately explained based solely on flash point considerations of the hydraulic fluids. The formation of a more volatile substance would explain the increased fire hazard.

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CLONING, EXPRESSION, AND ASSAY DEVELOPMENT FOR WEST NILE VIRUS RNA DEPENDENT RNA POLYMERASE (NS5)

The West Nile virus NS5 gene, also known as an RNA-dependent RNA polymerase (RdRp), has been cloned and expressed in an *E. coli* system. The enzyme was purified via a cobalt affinity column specific for the polyhistidine tail engineered onto the 3' end of the gene. Polyacrylamide gel electrophoresis and Western blot analysis indicate a protein with a molecular weight of 100,000 daltons, which is in agreement with 97,000 daltons calculated from the sequence. The purified enzyme was unable to use poly(A) as template with [^{3}H]-UTP as nucleotide substrate. However, the crude and partially purified enzyme displayed template-dependent polymerization using poly(U) as template and [^{3}H]-ATP as triphosphate substrate. Contrary to previous reports, this polymerization activity was shown to be primer independent.

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SURFACE DYNAMICS OF 1,4-DICHLORONAPHTHALENE FROM DEPOSITION TO DESORPTION ON Al_2O_3 (0001)

A more complete study of the dynamics of adlayer molecules on dielectric surface of Al_2O_3 was done. In particular, the two transitions that are exhibited in the excimer fluorescence were more closely examined. One of the transitions is the amorphously prepared adlayer becoming ordered. The other transition has been tentatively assigned as the ordering of the excimer to the more stable geometry, possibly one in which the two molecules are in the staggered configuration. By pre-annealing the adlayer before the surface temperature is ramped, transformations occur in the adlayer that cause the adlayer to settle into more thermodynamically stable forms. Such processes are not reversible.

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COMPUTATIONAL COMPARISON OF NONACTIN AND PROPOSED 3,4-TETRAHYDROFURO-TETRAESTER

This research utilized the molecular modeling program CAChe, MNDO-PM5 calculations to compare the binding energies and conformations of proposed tetraester macrocycle/cation complexes to known ionophore/cation complexes. The monomers for the macrocycle are ultimately synthesized via ISNC of propargylic nitroethers. The lowest energy conformers for the compounds were generated via the CONFLEX program. The energies of complexations of the macrolides with thiocyanate salts were explored. Nonactin complexes were compared to the Cambridge Crystallographic Data Center. The novel macrocycle shows very similar thermodynamic values, coordinate bond distances and partial charges as compared to the known ionophore in the CAChe calculations.

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WAVELENGTH-RESOLVED TEMPERATURE PROGRAMMED DESORPTION OF 1,4-DISUBSTITUTED NAPHTHALENES ON Al_2O_3 (0001)

When a surface is deposited with naphthalene and substituted naphthalenes, electronic excitation causes the formation of excited state dimers, or excimers. When the molecules gain access to sufficient thermal energy as the surface is heated in a temperature programmed desorption experiment, activation energies towards the formation of lower energy species are overcome. Changes in the excimer forms as reflected in the spectral shifts in the excimer emission were observed by wavelength-resolved temperature programmed desorption. These shifts allow the determination of the changes in the binding energies as more stable species of excimers are formed.

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THE EFFECTS OF PARTICULATE MATTER ON THE LUNG FUNCTION OF COLLEGIATE ATHLETES

The purpose of this exploratory study was to evaluate the effects of inhaled particulate matter on the lung function of collegiate runners. Using a personal environmental monitor, samples of particulate matter were collected at air intake level during runs. Only particles of 2.5 µm in diameter or less were collected. Before and after runs the athletes conducted lung function tests using spirometric methods. The filters were extracted and analyzed for inorganic components. These data were compared to the change in lung function measured by the athletes before and after each run. In this experiment, potassium and ammonium were associated with a decrease in the lung function according to FVC measurements, while chloride showed potential decreased lung function due to FEV_1 measurements.

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SOLID-STATE CP-MAS ^{13}C NMR ANALYSIS OF SEAWEEDS FROM THE CHINCOTEAGUE BAY, VIRGINIA

Seaweeds have been increasingly used in medical, agricultural, and industrial research due to their high content of carbohydrates, proteins, vitamins, and minerals. Most research on carbohydrate composition of seaweeds has been conducted using liquid NMR. Unlike liquid NMR, solid-state ^{13}C NMR facilitates analyzing crude samples in their entirety, rather than single pure fractions. CP-MAS ^{13}C NMR spectra from representative species of brown (*Fucus vesiculosus*), red (*Gracilaria tikvahiae*), and green (*Ulva lactuca*) seaweeds from the Chincoteague Bay of the Delmarva Peninsula were compared for the first time to determine variations in the overall chemical composition of different taxonomic groups of seaweeds. Although minor differences were detected in peak integration, the spectra from the three species exhibited high degree of similarity. The major peaks, in all spectra, were from carbons associated with polysaccharides, and the minor peaks, occurring mainly in the aromatic and aliphatic regions, could likely be from fats, vitamins, and other natural products.

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Since the 1980s, club drugs have been used to enhance sociability at gatherings such as raves and parties, and many of these drugs have been associated with drug-facilitated sexual assaults. A novel, sensitive, accurate, and reproducible CE-UV method was developed targeting three common club drugs: methamphetamine, 3,4-methylenedioxymethamphetamine, and ketamine. The capillary electrophoresis system was a Beckman P/ACE 5000 System with a 50µm i.d. uncoated fused-silica capillary regulated at a constant 25°C. The amount of each drug is quantitated in the range of 25-300 µg/mL using UV detection at 214nm. The method accommodates an unfiltered human urine sample and separation of the drugs from matrix peaks is facilitated by a 0.05 M phosphate run buffer at pH 3.0, a run voltage of 30 kV, and methanol as an organic modifier. This bioanalytical method requires minimal sample preparation and sample volume and has a run time of less than 7 minutes.

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