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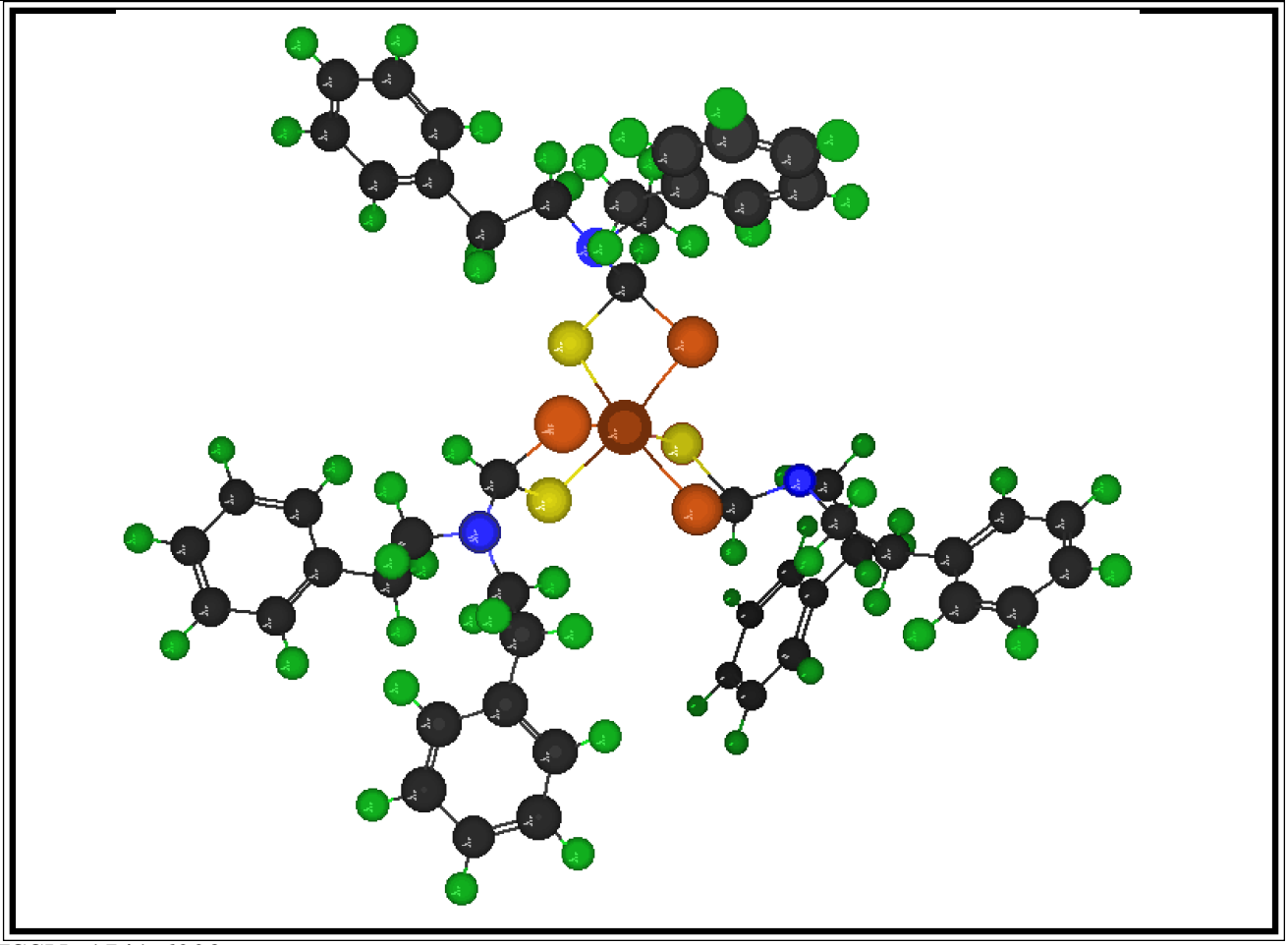

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DETERMINATION OF THE ABSOLUTE CONFIGURATION OF (+)-NEOMENTHOL USING MOSHER ESTERS

The (*R*) and (*S*)-a-methoxyphenylacetate esters of (+)-neomenthol were prepared using DCC and catalytic DMAP, and 1D and 2D spectral analysis used to completely assign their NMR spectra. There was a clear pattern in the difference in shifts between the (R) and (S) esters, which, according to the Mosher model, correctly predicted the absolute stereochemistry at C-1 of neomenthol to be *S*. Computational analysis suggested that the esters adopted an extended staggered conformation between the benzylic carbon and the secondary alcohol carbon, with the phenyl group residing on the same side as predicted in the Trost model.

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OXIDATION OF CHROMIUM (III) BINDING PROTEINS AND IMPLICATIONS FOR INSULIN ACTIVITY IN GLUCOSE METABOLISM

The usage of chromium(III) compounds in dietary supplements for weight loss and the treatment of type II diabetes has become prevalent. Chromium(III) is thought to aid in glucose metabolism but the molecular mechanism is not currently understood. The large consumption of any transition metal is a cause for concern especially when the mode of action is not well understood. One proposed mechanism for how chromium(III) aids in glucose metabolism is through the use of chromium binding peptides and proteins which act as inhibitors in the protein tyrosine phosphatase (PTP) pathway. In this paper we present experimental results for PTP inhibition using both trivalent and oxidized forms of a novel chromium binding protein. UV-visible spectroscopy was used to test for which form, if any, was responsible for enzymatic inhibition. Preliminary results indicate the oxidized chromium(III) binding protein shows enzyme inhibition, and as a result, could lead to increased insulin activity whereas the chromium(III) binding protein did not.

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ANTIOXIDANT DISTRIBUTION IN THE VARIOUS PARTS OF THE MANGO FRUIT

Parts of the mango fruit: peel, pulp, kernel and seed, were analyzed to determine the distribution levels of antioxidants using two UV-VIS spectroscopic techniques: the ferric reducing antioxidant power (FRAP) and the free radical trap 2,2-diphenyl-1-picrylhydrazyl (DPPH). Both methods found significant concentrations of antioxidants in the fruit samples. The concentrations of antioxidants in the seed portion were found to be at least two times, four times and seven times higher than those in the peel, pulp and kernel respectively. These findings were further confirmed using high performance liquid chromatography (HPLC) which found the concentrations of gallic acid (a polyphenol) in the samples to be two times, seven times and fifteen times those in the peel, pulp and kernel respectively. The seed portions of the mango fruits were therefore found by all methods to contain the highest level of antioxidants; with the concentrations in various parts in the order; seed > peel > pulp> kernel. Determining which part of the mango fruit contains the highest level of antioxidants promotes better use of the fruit to protect against adverse oxidative reactions in the biological system.

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SYNTHESIS OF 2,5-BIS-(4-ACETYLSULFANYL-PHENYL-ETHYNYL)TEREPHTHALIC ACID DIBUTYL ESTER AS A POTENTIAL MOLECULAR WIRES

Described in this report is the synthesis of 2,5-Bis-(4-acetylsulfanylphenylethynyl)terephthalic acid dibutyl ester. The starting molecules for this project are 4-iodoaniline and 2,5-dibromo-1,4-dimethylbenzene. The target compound for this study will contain a central phenyl unit with electron withdrawing ester groups attached along with phenylthioacetate endgroups. The phenylthioacetate endgroups will allow for the formation of self-assembled monolayers onto gold surfaces for electrical conductivity testing once the acyl protecting groups are removed. The key reaction steps involved in this synthesis include oxidation, esterification, protodesilylation, Sandmeyer reaction, and the Songoshira- Castro-Stephens crossing coupling.

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EFFECT OF REPLACEMENT OF SULFUR BY SELENIUM ON THE THERMAL DECOMPOSITION OF SOME IRON(III) DITHIOCARBAMATES

The thermal decomposition of tris(dibenzyldithio-, thioseleno-, and diselenocarbamato)- and tris(dicyclo-hexylthioselenocarbamato)-iron(III) have been examined by gas chromatography/mass spectrometry (GC/MS) and thermogravimetris analysis (TGA). The GC/MS of the three dibenzyl derivatives are strikingly similar. The mass spectra of the pyrolysis products of the selenium-containing derivatives showed few selenium containing fragment ions. No metal containing fragment ions were identified in any of the mass spectra. The products of thermal decomposition appear to be FeX or Fe_2X_3 (where X = S for dithio- and X=Se for the selenium-containing analogs). The TGA of the dicyclohexyl derivative was more complex and took place at a lower temperature.

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CHARGE NEUTRALIZATION STUDY OF MIXTURES OF Al_{13} WITH ALUM

Partially neutralized aluminum solutions with a basicity ($[OH^-]/[Al^{3+}]$) of 2.5 contain the polymeric aluminum moiety, $[AlO_4Al_{12}(OH)_{24}(H_2O)_{12}{}^{7+}]$, represented as Al_{13} at more than 90% of the total Al. Coagulants can be titrated into raw water until a zero zeta potential is achieved. Water types (pH range of 7.1 to 7.9) of varying alkalinity (50 and 100 ppm $CaCO_3$) and varying turbidity (~9.0, ~62, ~160 NTU) achieved a zero zeta potential with mixtures of Al_{13} and aluminum sulfate using the least amount of total aluminum compared to aluminum sulfate (monomeric aluminum) alone.

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