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Silacyclohexanes and silaheterocyclohexanes: Synthesis, stereochemistry and conformational analysis

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The studies of cyclohexanes were a keystone of modern conformational analysis. In contrast, until recently, silacyclohexanes and even more so silaheterocyclohexanes were much less studied. The principal question is if the introduction of silicon leads to consequences different from those caused by other heteroatoms. The answer is 'yes', and the lecture will focus on the reasons. Principal differences of sila(hetero)cyclohexanes from cyclohexanes are different conformational preferences (low or even negative conformational energy of substituents at silicon), much lower inversion barriers in sila(hetero)cyclohexanes, different importance of steric and electronic effects (predominance of steric effects in cyclohexanes and of electrostatic effects in sila(hetero)cyclohexanes), additivity of conformational effects in silacyclohexanes vs. their nonadditivity in cyclohexanes, the absence of principal difference between gas and solution for cyclohexanes in contrast to the often observed reverse of conformational preferences in gas and solution for silaheterocyclohexanes. The effect of the second heteroatom in silaheterocyclohexanes will also be discussed. The conclusion that will be made is that silacyclohexanes and the more so silaheterocyclohexanes are very interesting compounds, which are principally different from their carbon analogs. The difference concerns not only structural and conformational properties, but also their synthetic behavior and patterns of reactivity, as will be demonstrated in the lecture.

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The remediation of contaminated water from heavy metals (Ni^{+2}, Zn^{+2}) using coffee husk as a green sorbent material

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Wastewater contamination is a problem, which the whole world is now facing. Industrialization and globalization has led to the production and disposal of large amount of heavy metals in the environment resulted in an increase flux of metallic substances in the aquatic environment. Removing of heavy metals from contaminated water using biomass materials is a modern technology, which is characterized with low cost, high efficiency, renewable source, and availability. Biomass sorption such as coffee bean, chaff, rice husk and peelings from trunk of palm tree were investigated. In this study, coffee husk has been used as sorbent material, batch experiment was performed to study adsorption potential of coffee husk at initial concentration of 400 ppm with different contact time, concentration, pH and temperatures with the (Ni, Zn) metal concentration measured by ICP-OMS. The scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDX) was used for characterization studies. The results showed that the equilibrium contact time was 90 minutes and the average removal efficiency was 60% for Ni+2 and 45% for Zn+2. The adsorption capacity of the sorbents was 12.34, 10.30 mg/g for Ni+2 and Zn+2 respectively. The adsorption data was applicable on Langmuir and Freundlich isotherm models and adsorption of Ni and Zn ions perfectly follow the pseudo-second-order kinetic model. The present investigations revealed that the coffee husk as biomass sorbents could be a sufficient removal of heavy metals from wastewaters.

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