THE SYNTHESIS OF HETEROCYCLIC COMPOUNDS BY USE OF ORGANOMETALLIC COMPLEX. THE SYNTHESIS OF OXINDOLE AND ISOQUINOLINE ALKALOIDS

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The heterocyclic compound was synthesized via arylmetal complex($ArMXL_n$) which was prepared from aryl halide(ArX) and low valent metal(ML_m). In the extension of these studies, the natural alkaloids were synthesized.

1. The synthesis of heterocyclic compounds by the reaction of arylnickel complex ($ArNiXL_n$) with internal double bond and the application of this method

o-Chloro-N-allyl-N-methylaniline was refluxed with MeMgBr in the presence of a catalytic amount of $NiCl_2(PPh_3)_2$ in tetrahydrofuran for 30 min to give 1,3-dimethylindole in 53% yield. In the same manner, 1-methyl-4-methylene-1,2,3,4-tetrahydroquinoline(90%) and 1-methyl-5-methylene-2,3,4,5-tetrahydro-1H-1-benzazepine(62%) were obtained. When the functional group was present in the molecule, zerovalent nickel complex[$Ni(PPh_3)_4$] was used and many oxindole derivatives were prepared. Further extension of these studies, the natural alkaloid,[6-hydroxy-2'-(2-methylpropyl)-3,3'-spiro-tetrahydropyrrolidino-oxindole], was synthesized.

2. The synthesis of benzolactam by palladium catalyzed amidation and the total synthesis of sendaverine

It has been already reported that o-bromo-aminoalkylbenzene was heated with a catalytic amount of $Pd(OAc)_2$ and PPh_3 in the presence of $n\text{-}Bu_3N$ in an atmosphere of carbon monoxide to give benzolactams. The substituents at the aromatic ring were not effected in this reaction and thus, N-benzyl-2-bromo-4,5-dimethoxyphenethylamine gave N-benzyl-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinolin-1-one in good yield(78%). As the application of this synthetic method, the natural alkaloid, sendaverine, was synthesized.