The design, synthesis and control of self-assembly of coordination compounds is of great significance thanks to develop a variety of new complexes with desirable chemical and physical properties [1]. In this regards, a wide range of factors can control coordination sphere and effect the final structure, such as metal, counter ions, organic ligands, solvent, temperature, reaction conditions, metal to ligand ratio and flexibility of ligand. Among all, modification of ligand is more popular throughout researchers; major changes in the structure and length of ligand, the donor atom and its position as well as ligand flexibility is in the top of investigations. Despite numerous related reports, consideration of slight changes in the ligand substitution along with the constant coordination mode and the same metal in the equal reaction conditions have not been pay serious attention. Therefore, we encourage designing a series of substituted organic ligand with the same donor site to react with HgBr$_2$ in the same reaction conditions in order to study the result of such a little change through the structure. For this purpose, we choose fluorine atom as the substitution group because of its special properties. The fluorine atom, thanks to high electronegativity and low polarizability, manifests extraordinary properties when bound to other atoms particularly in C‒F rich compounds[2] and impresses deeply on the properties of chemical and material and their application[3].

Accordingly, a series of N-(fluorinatedphenyl)-2-pyrazinecarboxamide ligands, LF$_n$, those bear several fluorine substituent in different positions of phenyl ring, have been applied to synthesize mercury(II) coordination complexes to investigate the effect of tiny modification of ligand on the both coordination sphere and overall crystal structure. It is worth mentioning that, the general structure of ligand and its functional group are fixed in all cases and just the position and number of fluorine are varied from one to another. What is witnessed through the current research is that, the presence of fluorine in different position of ligand exercise influence on not only the first coordination sphere but also supramolecular architecture and construction. As a matter of fact, small changes in the position and number of fluorine direct coordination sphere around metal ions as well as arrangement of building blocks.


**Keywords:** fluorine, ligand substitution, diversity