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This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research.

Isatoic Anhydride

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Introduction

The abundance of heterocyclic motifs in bio-active natural products challenges many researchers to acquire such heterocyclic compounds in the laboratory level. The progress of green chemistry in the synthetic process favors the tandem reactions over the multistep synthesis. Isatoic anhydride (1) is a fascinating molecule with a broad spectrum in the synthesis of pharmaceuticals and natural products by tandem reactions. It is commercially available and can be synthesized by different approaches (Scheme 1).

Abstracts

(A) 2,3-Dihydroquinazolin-4(1H)-ones:
This molecular framework possess a wide range of pharmaceutical activities, for example, they are used as antifertile, antibacterial, and antifungal agents. The compounds can be synthesized by cyclocondensation of 1, amines, and aldehydes in the presence of Fe₃O₄ nanoparticles or ionic liquid in water.

(B) 1′H-Spiro(isoindoline-1,2′-quinazoline)-3,4′(3′H)-dione:
Spirooxindole derivatives show very good therapeutic action as anticancer, diuretic, and analgesic agents. These heterocyclic compounds can be synthesized by the tandem reaction of isatin, aldehydes, and amines in the presence of potassium alum.

(C) Quinazolin-4-ones:
Isatoic anhydride is an excellent precursor for the decarboxylative carboamination of alkynes to give quinazolin-4-ones. For this chemical transformation Ni(cod)₂ is used as efficient catalyst.

Scheme 1 Synthesis of isatoic anhydride (1)
(D) 2-Styrylquinazolin-4-ones:
2-Styrylquinazolin-4-ones are associated with inhibitory effects on the tubulin polymerization. [Hmim][TFA] serves as a dual-purpose catalyst to construct the 2-methyl-quinazolin-4-ones as well as the Knoevenagel condensation with aldehydes to form the final products.5

(E) 2,3-Dihydroquinazolin-4(1H)-ones:
This molecular framework achieved popularity due to its potential application as antimicrobial and antitumor agents. Amino acids react with 1 to form amides, which cyclized under treatment with POCl₃ to form the final product.6

(F) 2-Arylbenzoxazole/benzthiazoles:
These molecules are widely used in pharmaceutical as well as in non-pharmaceutical industries and can be synthesized by cyclocondensation of 1 with 2-aminothiophenol or 2-aminophenol.7

(G) Polydentate ligands:
The synthesis of polydentate ligands for the supramolecular chemistry gained a new momentum in the field of bioorganic chemistry. Schiff’s bases are very popular to construct the macrocyclic ligands. Diamines and aldehydes are being subsequently used with 1 to construct polydentate ligands.8

(H) Sivelestat sodium:
This molecule is used for the treatment of acute lung injury associated with the systematic inflammatory response syndrome. It is also used in the composition of antiwrinkle cosmetics. The treatment of 1 with glycine ethyl ester first forms an amide, which subsequently reacts with pivaloyloxy benzene sulfonyl chloride to form Sivelestat.9

(I) Fuligocandines A and B:
These two natural products were isolated from myxomycete Fuligo candida. They are biologically potent to sensitize leukemia cells to apoptosis caused by the tumor necrosis factor related apoptosis-inducing ligand. An Eschenmoser episulfide contraction is the key step to synthesize the bioactive cycloanthranilylproline derivative.10

References