43. Title: Green chemistry method for preparing biologically active substituted alkanes from aldehydes and ketones

Inventor: Prof. Chinmoy K. Hazra, Department of Chemistry

Keywords: Alkanes, Brønsted Acid, Friedel-Crafts Arylation, Bio-active Natural products

Domain: Material Science

Summary:

Di-, tri-, and tetra-substituted alkanes have applications as biologically active pharmaceuticals for various conditions. However, these are conventionally synthesized using methods involving harsh reaction conditions, expensive and toxic metal complexes, chemical additives, etc.

The present invention describes a green, step economic, atom economic, metal free protocol utilizing cheap and commercially available starting materials (feedstock aldehydes and ketones) for the synthesis of symmetrical as well as unsymmetrical di-, tri-, and tetra-substituted alkanes in high yield and regioselectivity. The aldehydes and ketones are treated with different arenes, in a mixture of chloroform-hexafluoroisopropanol and presence of a Brønsted acid catalyst, to obtain various substituted alkanes. The solvents used can be recovered and reused. The process has been used for the synthesis of various bioactive natural products like Arundine, Vibrindole A, and bioactive phenanthrene-based triarylmethanes having anti-breast cancer activity.

Advantages:

- Synthesis of various symmetrical as well as unsymmetrical di-, tri- and tetra- substituted alkanes in one pot under mild metal-free conditions without needing any sophisticated apparatus/conditions
- Atom economic as well as step economic
- Converts feedstock chemicals into value added products
- Works with a cheap Brønsted Acid catalyst (para toluene sulphonic acid)
- The used solvents (chloroform and hexafluoroisopropanol) can be recovered and reused
- Results in high yield (69-97%) of the products with regioselectivity similar to traditional Friedel-Crafts reaction

Applications: Synthetic, Bio-Organic and Pharmaceutical Chemistry, Novel Organic Materials Synthesis.

Scale of Development: Millimole (0.5 mmole) as well as gram-scale (20 mmole)

Technology Readiness Level: 4

IP Status: Indian Patent Application 202211031721