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Electrophilic Substitution Reaction Using Zncl$_2$ Catalyst/Sicl4-Nano3

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Abstract
Development of new Silane reagent derive from $SiCl_4$ was applied in the presence of $NaNO_3$ and $ZnCl_2$ (Homogeneous nitrating system). The nitration proceeds smoothly under mild conditions in good yield. Above reagent consider to be of economic advantage and environment friendly. Above reaction can be used for synthesis of potential drug.

Keywords: Nitration, Sodium Nitrate, Tetrachlorosilane

Introduction
Nitrated aryl compounds remained in dispensable over the last two centuries due to their industrial and commercial applications. They are used as plastics, explosives, agro chemicals, dyes, pigments and polymers. These compounds can be synthesized from aryl pre cursors employing various nitrating agents like nitric acid, metallic nitrates, nitronium salts and acetyl nitrates. But there are major drawbacks in using reagents. These are acidic corrosivity of the nitrating agents, poor regioselectivity and environmental pollutions. As nitrations are usually associated with heat, which may cause secondary reactions or decomposition of final product which leads to low purity and yield. Nitrate salts can be used but the reagent is not cheap. These are difficult to prepare, store and handle.

Method:
First it was used for the nitration of phenol. To a stirred solution of phenol in Dichloromethane (10 ml), $NaNO_3$ was added. TCS and $ZnCl_2$ were then added and the reaction mixture stirred at room temperature in the dark for about 40 minutes. After completion of the reactions, water was added and the reaction mixture was extracted with dichloromethane and dried over Na_2SO_4. The solvent is distilled off and resulting crude product can be separated by steam distillation. It can be successfully applied for the preparation of p-Iodonitrobenzene from Acetanilide.
4-Nitrophenol
Yield-55%, Yellow colored solid.
4-Nitrotoluene
Yield-65%, Yellow colored solid.
4- Iodonitrobenzene
Yield-70%, Black colored solid.

Reaction
$$SiCl_4 + ZnCl_2 + NaNO_3 \rightarrow NO_2^+ + + ZnCl_3^- - + Cl_3\,SiOCl_3 + NaCl$$
……. (1)…….
Aromatic compound + 1 → Nitrated Aromatic compound

Table 1: Effect of solvents in the nitration of phenol with NaNO3/TCS

Entry	Solvent	Conversion of time (min.)	Substrates molar ratios Phenol: $NaNO_3$:$SiCl_4$[a]	Products(s)	Yield%
1	Ethanol	0	1:1:1	b	-
2	Ethanol	0	1:2:2	b	-
3	Chloroform	260	1:2:2	o-Nitro phenol p-Nitro phenol	40 60
4	Dichloromethane	30	1:1:1:5	o-Nitro phenol p-Nitro phenol	30 70
5	Dichloromethane	30	1:1:2	o-Nitro phenol p-Notro phenol	40 60

a. No reaction was observed in the absence of TCS;
b. The reaction was exothermic, low yielding.

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