

Abstract ID: 007

**SYNTHESIS OF ARYL DIETHERS AND DIAMINES VIA C-X (X = O, N)
ULLMANN CROSS-COUPPLING OF 1,4-DIBROMOBENZENE**

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Abstract

The Ullmann cross-coupling reaction provides a versatile route for constructing aryl ethers and amines which serve as important aryl molecular scaffolds in functional materials. This study explored the synthesis and characterization of C-O and C-N coupled products derived from 1,4-dibromobenzene with various phenols/alcohols and amines. Reactions were carried out in dimethyl sulfoxide (DMSO) using activated copper bronze/Cu₂O/CuCl₂.2H₂O catalysts with Cs₂CO₃ as a base under atmospheric or nitrogen conditions at varying temperatures and time periods. Reaction progress was monitored by thin layer chromatography and crude products were purified by column and preparative chromatography. The purified products were characterized using FTIR and UV-visible spectroscopy. In the C-O coupling, the reaction of 1,4-dibromobenzene with benzyl alcohol (1:2 molar ratio) using 2 eq. Cs₂CO₃ and 10 mol % CuCl₂.2H₂O, in DMSO at 130 °C overnight afforded a new ether product. FTIR spectra exhibited characteristic peaks at 3174, 1029 and 720 cm⁻¹, consistent with phenyl / -OH, C-O-C and C-Br stretching vibrations confirming ether bond formation. UV-vis analysis showed a λ_{max} at 272 nm indicating π-π* transitions of a conjugated π system. In C-N coupling, the reaction of 1,4-dibromobenzene with benzyl amine (1:2 molar ratio) under similar conditions but with 5 mol % CuCl₂.2H₂O at 130 °C for 4 h produced a new amine product. The FTIR spectrum exhibited the disappearance of characteristic stretching vibration peaks of -NH₂ around 3300–3500 cm⁻¹ supports successful C-N coupling. Further structural confirmation of both ether and amine derivatives requires ¹H and ¹³C NMR spectroscopy.

Keywords: *Functional materials, Molecular scaffolds, Ullmann cross-coupling*

Financial assistance from Research Council, University of Sri Jayewardenepura (Grant No. ASP/01/RE/SCI/2021/35) is acknowledged.