4,5-DICYANOPYRIDAZINE: HETERO DIELS-ALDER REACTIONS 
VERSUS AROMATIC NUCLEOPHILIC SUBSTITUTIONS

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4,5-Dicyanopyridazine (DCP) (1) showed an exceptional reactivity as heterocyclic azadiene in inverse electron-demand Hetero Diels-Alder (HDA) reactions with different dienophiles. The use of alkenes [1], alkynes, and enamines [2] as 2π electron counterparts afforded cyclohexa-1,3-dienes and substituted phthalonitriles, respectively, while suitable bis-dienophiles allowed to achieve a general strategy for the one-pot synthesis of polycyclic carbo- and hetero-cage compounds, through pericyclic three-step homodinoo processes [3].

Direct benzoannelation reactions of heterocyclic dienophiles such as pyrrole and indole derivatives 2 were also performed through HDA cycloadditions with 1, leading to dicyanoindoles and carbazoles 3 [4]. Anyway, depending on the experimental conditions, competitive nucleophilic substitution processes on the strongly electrophilic C-4 carbon of 1 appeared to assume a significant role affording pyridazine derivatives 4 [4b,4c].

These competitive mechanisms and in particular the possibility to control efficiently both reaction pathways to attain the synthesis of diverse heterocyclic compounds have been investigated. Moreover, the potentialities of this unprecedented reactivity of DCP were tested employing different nucleophiles, likely able to provide a facile access to substituted pyridazines 5.

Mechanistic features and synthetic applications will be properly discussed.