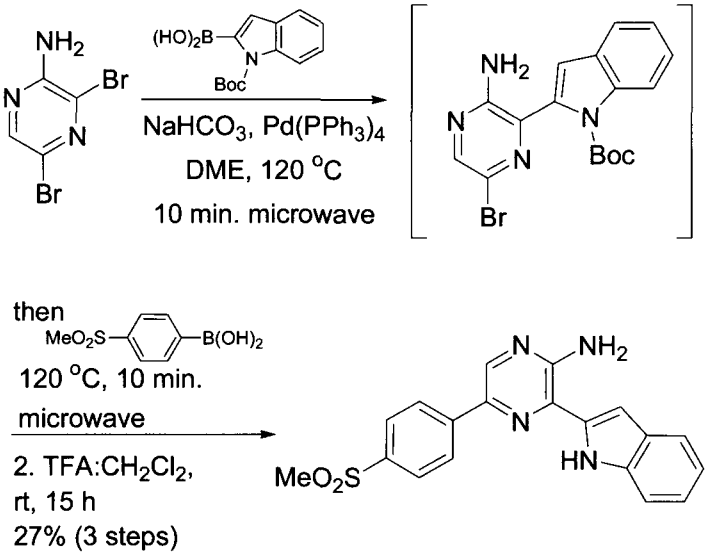
limited benefit. These cancers are proficient in repairing the damaged DNA. Studies to prevent this repair by inhibiting two phosphoinositol 3-kinase-like kinase (PIKK) family members ATM (ataxia telangiectasia mutated) and ATR (ATM and Rad-3 related) led to the regioselective Suzuki coupling of a dibrominated pyrazine. This pyrazine first underwent coupling *ortho-* to the amino group followed by a second coupling to provide the multicyclic ring system, displaying high levels of inhibition against the targeted kinases.[62]



In an effort to expand the known chemical reactivity on the heterocycle of quinoxaline, an intramolecular Heck coupling protocol was optimized.[63] In order to accomplish the formation of the biologically significant pyrrole ring, secondary and tertiary aminoquinoxalines are reacted with the halogenated quinoxaline. Quinoxalines with their unique 1,4-diazine moiety are not the ideal substrates for the Heck reaction because they are not only more labile than the simple benzene counterpart but are also strong chelating agents which can coordinate to and poison the palladium catalyst. Aminoquinoxalines are especially strong chelating agents, and catalytic efficiency is difficult to achieve for such substrates. Jeffery's "ligand-free" conditions gave higher yields than the traditional coupling procedures. The enhanced reactivity and yields are presumably due to the coordination and thereby solvation of the palladium intermediates by chloride ions present in the reaction mixture.