



Direct Amidation of carboxylic acids using a Borate Ester

Answers

1. Thinking of the other parameters discussed earlier (i.e. solvents; waste; energy; health and safety; work-up and isolation; catalysts; elemental sustainability):

a. Can you identify any 'hot-spots' or potential issues with the reaction?

For example:

2 equivalents of the Borate ester are used

DCM is used in the work-up – hazardous solvent

Waste contaminated with fluorinated material is generated

Reflux – 15 hours – energy intensive

b. Where is the reaction performing well in terms of its 'green credentials'?

For example:

Direct amidation – no prior activation step is needed

One to one stoichiometric ratio of reactants

No critical elements used

Work-up is fairly straightforward (no chromatography)

2. What other factors would you need to consider in order to assess the overall greenness of the reaction?

For example:

How is the reagent tris(2,2,2-trifluoroethyl)borate prepared? (May have hidden upstream issues)



3. Which areas would you target to further improve the green credentials of this research?

For example:

- Solvent screen
- Less MI work-up
- Lower amount of reagent or look for catalytic method

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