Oxidation of ethanol

In January 1990 Education in Science carried a note about two incidents in which the oxidation of ethanol by acidified dichromate(VI) suddenly became very violent, with the contents shooting out of the condenser. We suggested some possible causes, appealed for evidence in support, and asked for information about successful safe strategies.

This note produced far more responses than we have ever had before, and we are very grateful for all those who took the trouble to write in. It is quite clear that many chemistry teachers have experienced the "periodic, though attractive, colour changes on the lab ceiling" (to quote one correspondent), and that the problem only arises when ethanol is being fully oxidised to ethanoic acid.

There seem to be two likely causes:

- over-rapid addition of one reagent to the other two, so that separate layers form; and
- over-cooling the acid/dichromate (VI) mixture, so that addition of the ethanol does not cause the reaction to proceed rapidly, and hence little heat is generated. The reagents are fully mixed, but scarcely reacting.

In either case, a reaction proceeds very slowly. By the time it becomes noticeably exothermic it is too late - the reaction is a runaway.

Also it has been suggested:

"...have a mixture of ethanol and dilute sulphuric acid gently refluxing in a flask, and add the aqueous potassium dichromate dropwise down the condenser. If done carefully the Bunsen can be removed, and the heat of reaction will sustain the refluxing..."

We suggest that this procedure is worth trying - but whatever method you use make sure that everybody in the room is wearing eye protection the whole time.

This item was originally published in *EiS* in November 1990 and was checked by the ASE Health & Safety Group in July 2015 to ensure it still offers valid advice.