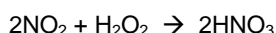
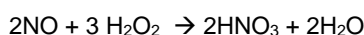


NITRIC ACID WITH HYDROGEN PEROXIDE: REACTION HAZARDS

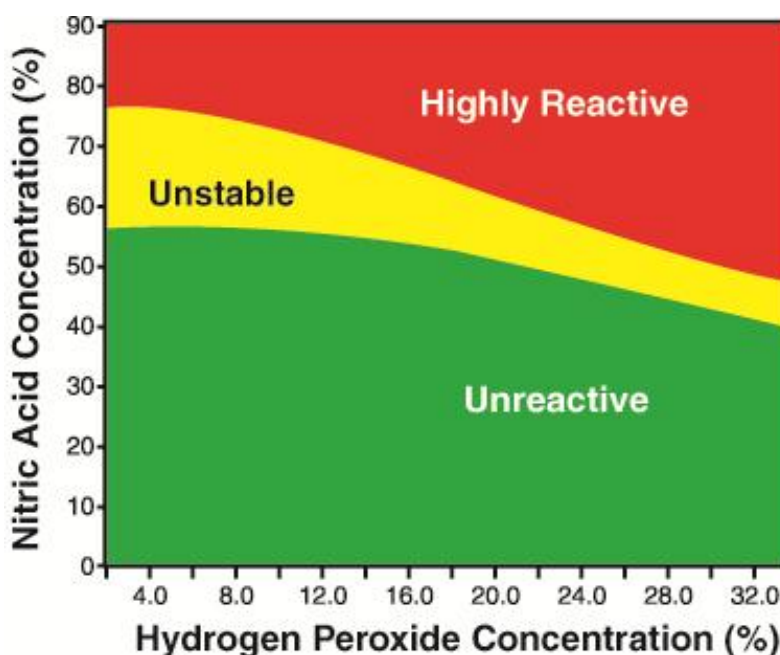
INTRODUCTION

Hydrogen peroxide is used in processes involving nitric acid or the formation of nitric acid. For example, hydrogen peroxide is used for the control of nitrogen oxide (NO_x) pollutants or their precursors, which results in the formation of nitric acid.



Concentrated nitric acid is also used to passivate equipment for use with hydrogen peroxide.

While nitric acid and hydrogen peroxide are both hazardous chemicals, there are additional hazards that can arise when they are mixed together. In particular a number of researchers (1,2,3) have reported that at nitric acid concentrations of greater than 35%, a reaction occurs that may be violent in nature and can produce heat and large volumes of NO_x gas.



Data from W.H. Hatcher and D.W. MacLauchlan, [Can. J. of Research. 16B, 253, (1938)]

It is imperative when handling hydrogen peroxide and nitric acid mixtures that care is taken to avoid mixing the chemicals in dangerous concentrations. Solvay Chemicals strongly cautions that in the presence of hydrogen peroxide, even at low concentrations, nitric acid strengths of greater than 35% must be avoided at all times. Solvay Chemicals also strongly recommends that a detailed review of any process or procedure involving hydrogen peroxide and nitric acid be carried out before any procedures are undertaken. Such a review should include a review of the process being undertaken and also a review of all potential scenarios that could result in high concentrations of nitric acid and hydrogen peroxide being mixed together.

To avoid the hazardous region, it is recommended that when mixing hydrogen peroxide and nitric acid together, the order of addition be water (if required), hydrogen peroxide then nitric acid. Attention should be paid to the addition and mixing processes used to ensure rapid mixing and to avoid localized mixing of concentrated hydrogen peroxide and nitric acid.

Where nitric acid is produced, either intentionally or as a by-product of hydrogen peroxide use, monitoring of the nitric acid and hydrogen peroxide concentrations should be undertaken and procedures adopted to ensure that high concentrations of nitric acid cannot be generated.

During passivation of equipment for use with hydrogen peroxide, the procedures set out in Solvay Chemicals' publication "Hydrogen Peroxide Passivation Procedure" (4) should be followed. Care should be taken to ensure that the correct concentration of nitric acid is used and that all the nitric acid is fully flushed from the system before hydrogen peroxide is introduced. Further details of the hazards associated with hydrogen peroxide and nitric acid are available from Solvay Chemicals.

References

1. R.N. Sah and R.O Miller, Anal. Chem. 64,230 (1992)
2. NFPA 491 Guide to Hazardous Chemical Reaction, ©1997, National Fire Protection Association, Quincy MA 02269 (Mellor 8, Supplement 2: 315, 1967)
3. W.H. Hatcher and D.W. MacLauchlan, [Can. J. of Research.16B, 253, (1938)]
4. Hydrogen Peroxide Passivation Procedure, available at www.solvay.com

**Before using, read Safety Data Sheet (SDS) for this chemical.
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