



Pyrotechnic Chemistry

Presented in the UK by
Tom Smith – Davas Ltd

A short course developed by Ken & Bonnie Kosanke
Journal of Pyrotechnics

Pyrotechnic Chemistry - a 3 day course

BASIC COURSE DESCRIPTION

The course is a blend of basic chemical principles, and the application of those principles to understanding pyrotechnics and to solving practical problems. Attendees will expand their knowledge of pyrotechnic chemistry, improve their proficiency in conducting research and development, and gain important insights regarding safety. The course is structured into a series of 12 modules, augmented with many video demonstrations. To aid in comprehension and retention of information, a copy of the Kosanke's recently published book *Pyrotechnic Chemistry* is included.

The course is designed for: those who have at least modest skills in pyrotechnics, but little or no formal chemistry background; and those who have a basic understanding of chemistry, but with little knowledge of pyrotechnics. Persons with little knowledge of either chemistry or pyrotechnics will benefit greatly from the course; but the amount of information presented will be more than can easily be retained.

Generally, the class is composed of a mix of industry personnel and individuals, working in both research and production. In this way there will be an opportunity for attendees to share and gain insights from their collective experiences.

COURSE INSTRUCTOR

The instructor for the UK courses is Tom Smith. Tom has a DPhil in organic chemistry from Oxford University and has had an involvement in the firework industry for over 30 years. Tom is currently chairman of the CBI/EIG pyrotechnic group and secretary of the British Pyrotechnists Association. Recent projects have also included acting as pyrotechnic consultant to the London Millennium celebrations and the 2004 Athens Olympics.

COURSE SCHEDULES

One course are planned in the UK this year 2007: 23/24/25 April. A later date may also be arranged (keep an eye on the website for more details). Each course will be run at Grafham Water Sailing Club, near Huntingdon, Cambridgeshire. The venue is easily reached and a variety of local accomodation is available. Further details are available from Davas Ltd. Each course will run from 9 am to 5 pm all three days. It is also possible to arrange bespoke courses to be run at your site if this is of interest.

COURSE COST

£350, including *Pyrotechnic Chemistry* book. Half of the £350 registration fee (£175) is due with your completed registration form. The remainder is due at or before the start of the course. Also included with the course are a certificate of completion and light refreshments. [A few scholarships are available for individuals not associated with a company, which reduce the fee to £250. Contact us for details.]

ATTENDANCE LIMIT

To give personalized attention to the needs of each attendee, the class size will be limited.

REFUND POLICY

Full refunds will be made for cancellations received at least two weeks before the start of the course. A charge of £25 will be made for cancellations received within two weeks before the start of the course. The full deposit may be forfeited for cancellations made within one week of the start of the class.

Further details will be provided to all course registrants as the time of the course draws nearer.

COURSE OUTLINE

Module I – Basic Chemical Principles

- Atomic Structure
- Chemical Bonds and Bond Types
- Chemical Names
- Chemical Formulae and Equations
- Common Pyrotechnic Materials

Module II – Pyrotechnic Chemistry, Ignition and Propagation

- Chemical Oxidation States
- Oxidation Reactions
- Reaction Energy Considerations
- Thermal Run-Away
- Pyrotechnic Ignition and Propagation

Module III – Pyrotechnic Primes and Priming

- Shimizu Energy Diagrams
- Ignition and Propagation Problems
- Prime Formulations and Application Techniques
- Alternatives to Priming

Module IV – Factors Affecting Burn Rate

- Choice of Fuel and Oxidizer and Their Ratio
- Degree of Mixing and Consolidation
- Particle Size and Shape
- Additives and Catalysts
- Temperature, Pressure and Confinement
- Physical Form and Consolidation
- Geometry, Crystal and Environmental Effects

Module V – Aspects of Pyrotechnic Burning

- Pyrotechnic Delays
- Parallel vs. Propagative Burning
- Black Match and Quick Match Mechanisms
- Rocket Performance / Malfunctions
- Burning, Deflagration and Detonation

Module VI – Physical Basis for Coloured Light Production

- Nature of Light
- Line, Band and Continuous Emissions
- Chromaticity Diagrams
- Additive Colour Laws
- Colour Theory Applied

Module VII – Chemistry of Coloured Flame

- Mechanism of Coloured Light Production
- Colour Agents and Colour Species
- Colour Enhancers
- Optimizing Colour Quality
- Use of Metal Fuels
- Special Topics

Module VIII – Chemistry of Sparks, Glitter and Strobe

- Light Emission from Sparks
- Control of Spark Chemistry
- Mechanism of Glitter
- Influence of Metal Fuels on Glitter
- Control of Glitter Delay
- Mechanism of Strobe Burning
- Control of Strobe Rate

Module IX – Pyrotechnic Smoke and Noise

- Physical Smoke
- Chemical Smoke
- Whistles
- Salutes and Reports

Module X – Approaches to Formulation Development

- Add or Substitute a Component
- Mix Compositions
- Triangle Diagrams
- Stoichiometric Approaches
- Other Approaches

Module XI – Pyrotechnic Sensitiveness

- Water Sensitiveness
- Auto-Ignition Temperature
- Friction Sensitiveness
- Impact Sensitiveness
- Electrostatic Sensitiveness

Module XII – Hazard Management

- Elements of Hazard Management
- Chemical Toxicity Hazards
- Pyrotechnic Hazards
- Hazardous Chemical Combinations
- Measures to Control Hazards

FURTHER DETAILS

Further details of the courses and a web forum dedicated to attendees is available at <http://www.pyrochemistry.net>

Pyrotechnic Chemistry - Course Registration form

Please complete a separate form for each person attending

Name		
Company*		
Address		
Email address		
Telephone No		
Course Dates (please tick)	23/24/25 April 2007	
Course Fee		

* A limited number of reduced rate scholarships are available for those attendees who are not associated with a company. Please contact us for further details.

Please complete and return this form with your deposit for the course (£175 - cheques payable to Davas Ltd) to

**Davas Ltd
8 Aragon Place
Kimbolton
Huntingdon
Cams
PE28 0JD**

Tel: 01480 860124

Email: pyrocourses@davas.co.uk

The balance of the course fee is payable at the start of the course.

For office use only

Date Rec	Fee	Balance	Invoice No
Book	Notes	Database	Complete