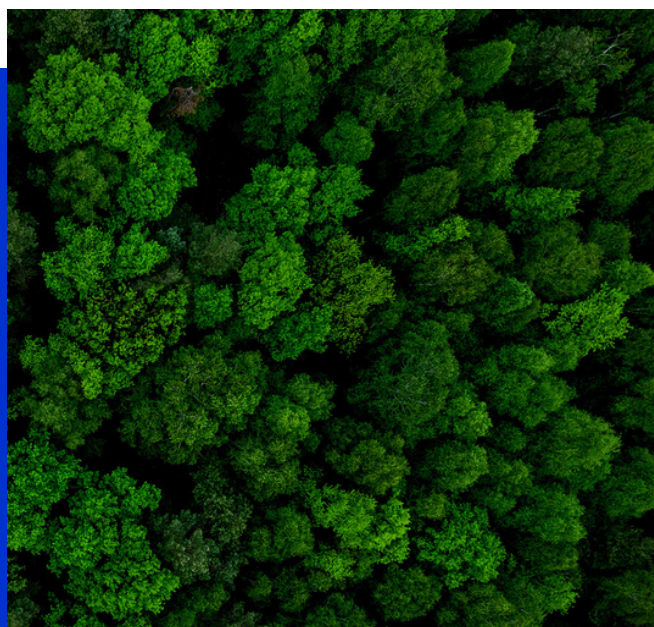
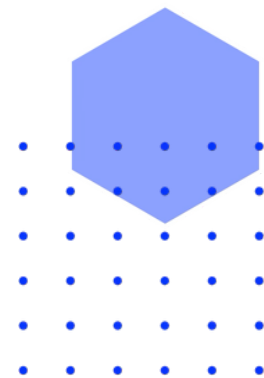


STOPPING THE SPARK

Chemistry at the Forefront of Fighting Wildfires



Wildfires are becoming more frequent and severe across Europe, increasing the importance of every tool available to firefighters. The role of chemical fire retardants, the environmental concerns surrounding their use, and the challenges of maintaining reliable supplies are becoming increasingly important.

Wildfires have been a common issue in Siberia, Africa, North America and Australia for decades. In Europe, wildfires have historically been less common but, since 2020, Europe has faced three extremely damaging wildfire seasons – 2022, 2025 and 2026. This year, more than half a million hectares have been burnt across over 1,500 wildfires in the UK, Belgium, Germany, France, Spain, Italy, Croatia and Greece. Some 300,000 people became displaced in France and Spain.

Firefighting services are reliant on using a toolkit of approaches, including direct ground attacks, firebreaks, controlled burns, and airborne chemicals.

Severe wildfires seem likely to persist in Europe, so it is vital that firefighters have access to all of the tools necessary to fight fires effectively. This will require:

- A pragmatic approach to regulations to allow useful chemicals to be used
- Efficiency in securing supplies to ensure accessibility
- Established ownership logistics to avoid political disputes

THE FIREFIGHTERS' TOOLKIT

To combat wildfires effectively, firefighters make use of a range of tools, applying increasingly drastic measures for particularly dangerous fires.

Direct Ground Attack

Just as in a household fire, water can be used to attack wildfires head on. Typically foaming or wetting additives are also added, to improve efficacy.

Wetting agents (i.e. alkyl polyglucosides, alcohol ethoxylates, sulphates and sulphonates) reduce the surface tension of water allowing it to spread easier.

Foaming agents (i.e. alpha olefin sulfonates, alcohol ethoxylate surfactants, lauryl sulfate derivatives and amine oxides) are designed to create a foam blanket coating vegetation and other substances a wildfire could use as fuel.

Beyond the use of water, swatters and digging tools can be used to smother less intense fires, and blowers can push a fire back onto spent fuel.



Firebreaks and Controlled Burns

Fires can be stopped when there is no fuel to consume. This can be done by using firebreaks (cut back vegetation) and controlled burns (organised burns of vegetation to prevent excessive build-ups).

However, controlled burns have been seen getting 'out of hand', leading to private property damage. Such incidents have led to arrests of the organisers.

Firefighting with Chemicals

Fire retardants are another tool that can be used to fight wildfires: specialised water-based solutions that suppress fires.

THE CHEMISTRY OF FIRE RETARDANTS

Fire retardants contain **active ingredients** (*the main chemical fighting fires*), **thickening agents** (*for even distribution*) and **red colourings** (*to mark treated areas*).

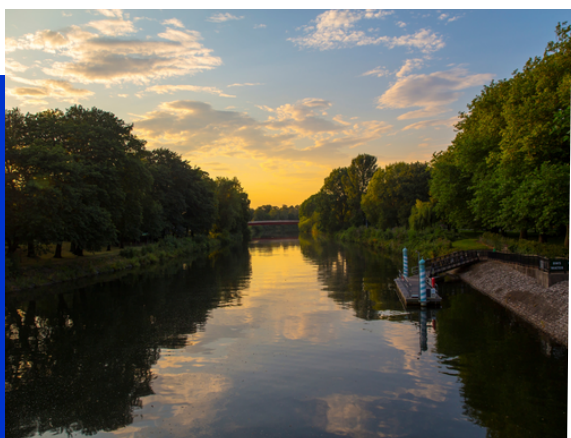
Active ingredients include ammonium phosphates and ammonium sulphates. For example, MAP (monoammonium phosphate) or DAP (diammonium phosphate). These fight fires via three main mechanisms:

1. Ammonium phosphates absorb a lot of heat during thermal decomposition, cooling fires.
2. Decomposition products such as ammonia (NH_3) and phosphorous dioxide (PO_2) are radical traps in the gas phase, inhibiting radical oxidative pathways essential in the chain reaction of a fire.
3. The fire retardant leaves a glassy film of phosphate char on the burnt, solid substance, creating a barrier to oxygen, inhibiting relighting.

Global players such as **Nutrien**, **The Mosaic Company**, **ICL Group**, **OCP Group**, and **Yara International** produce ammonium phosphates.

CONCERNS AROUND CHEMICAL FIRE RETARDANTS

Fire retardants have been used in firefighting for years, evolving in response to environmental and logistical concerns.



Environmental Concerns

Borates were historically used during the 20th century in aerial attacks against wildfires. However, these compounds were shown to sterilise soil and were subsequently banned by the US Department of Agriculture Forest Service and are banned under REACH regulation in the EU.

Today, borates have generally been replaced by ammonium phosphates, due to their enhanced efficiency and fertiliser residue.

However, ammonium phosphates face growing environmental scrutiny as phosphate run-off can cause algal blooms in local waterways, reducing oxygen levels, thus harming aquatic ecosystems. Residual nutrients may also encourage the growth of invasive plant species. Regulators generally permit their use, but their application near waterways is subject to restrictions. In the US, federal guidance prohibits aerial retardants being dropped within 300 feet of waterways, unless necessary to protect life or property. EU REACH currently does not classify ammonium phosphates as hazardous, and the rules for application near waterways are implemented at the member-state level.

Research into safer alternatives is ongoing. Compounds such as phytic acid, lignin and pomegranate rind have potential to be char-forming agents, like ammonium phosphate, but are not toxic to aquatic life.

Increased Funding of Firefighting Supplies and Equipment

Fire retardant funding in Europe is shared between the EU and national governments. The EU's rescEU reserve has invested €600m in 12 firefighting aircraft due to be operational in 2027, supporting strategic stockpiles and long-term procurement. However, primary responsibility for firefighting remains with national and often local authorities, which can reduce economies of scale and lead to uneven preparedness.

CONCLUSION

Wildfires are becoming a long-term challenge for Europe. A recent Potsdam Institute study projects a roughly 40% increase in annual area burned this century, but also finds that use of the full firefighting toolkit, including chemical fire retardants, could cut burned area by more than 70%.

To maximise resilience, Europe should:

- Maintain pragmatic regulation to ensure flame retardants are used by balancing benefits versus any impact on the environment and natural habitats
- Secure reliable supplies of firefighting equipment and retardants, including local production and strategic stockpiles where appropriate
- Increase research and development into alternative chemicals for fire retardants.

ABOUT NATRIUM CAPITAL

Natrium Capital Limited is the specialist Chemicals Mergers and Acquisitions (M&A) boutique which sets a new standard in advice. Led by Alasdair Nisbet and staffed by bankers, all of whom are also scientists, Natrium Capital provides strategic and M&A transaction services focused on the chemical industry, covering, amongst others: plastics, fine and specialty chemicals, paints and coatings, inks, adhesives, personal care ingredients, food ingredients, chemical distribution, engineering materials, biotechnology and clean technologies.

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- **ALASDAIR NISBET**
CHIEF EXECUTIVE OFFICER
+44 7767 207 185
alasdair.nisbet@natriumcapital.com

- **JENNIFER MIDURA HEYWOOD**
MANAGING DIRECTOR
jennifer.midura.heywood@
natriumcapital.com

- **IANNIS PHOTTIOU**
DIRECTOR
iannis.phottiou@
natriumcapital.com

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