Laboratory Characterization of Toxic Air Emission from Fire Retardant Used in Wildfires

Emi Okitsu
University of Montana, W.A. Franke College of Forestry and Conservation, emi.okitsu@umontana.edu

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**Introduction**

What are fire retardant made of?[1]
- Ammonium salt
- Water
- Thickening additive
- Color agents
- Corrosion inhibitors

What are the ecological impacts?
- Contaminate water
- Kill fish
- Fertilize noxious plants

**Objectives**
- Compare emission factors of fire retardant burning and biomass burning
- Estimate ammonia and VOC emissions from a wildfire
- Investigate health impacts of fire retardant on firefighters

**Methods**

**Instruments**
- Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer
- LI-COR CO₂ Analyzer

**Materials**
- LC-95A-R (Phos-Chek)
  - Ammonium polyphosphate
  - Red iron oxide
- Ponderosa pine needles

**Three Burning Experiments**
- Fire retardant + pine needle
- Pine needle only
- Fire retardant only

**Result: Emission Factor**

**Fire Retardant Burning vs. Biomass Burning[4]**

**Result: Exposure**

**Formaldehyde: CH₂O**

Health Impacts: (Short exposure) burning sensation on the eyes, nose, and throat. Nausea and skin irritation. (Long exposure) cause certain types of cancer.[8]

**Workplace Exposure Limit:** 0.75 ppm (8 hours) 2 ppm (15 minutes)[9]

**Conclusion and Implications**

- Fire retardant has high emission factors of ammonia and some VOCs
- Applying fire retardant to wildfires can increase ammonia emissions
- Burning both fire retardant and biomass together may enhance firefighter’s health risks

**References**


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