

## **Synthesis of Disulfide Triazole Phosphorus Fire Retardant via Photochemical Conditions**

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The development of fire retardants (FR) is critical in enhancing fire safety and advancing fire science. This project proposal outlines the synthesis of a novel disulfide triazole phosphorus thioacid fire retardant under photochemical conditions, along with future relevant testing to collect data on plume generation, aligning with the NSF EPSCoR's HDRFS program goals. The proposed specific synthesis and conditions provide for a more efficient and environmentally greener route compared to conventional methods, utilizing photochemical click reactions. Furthermore, the addition of sulfur element to conventionally sole phosphorus-based FR reduces the chance of leaching by increasing the molecular weight of the compound and overcoming the obstacle of low molecular weight problems while also gaining higher thermal stability. By pairing the favorable properties of phosphorus, sulfur, and triazole, an effective and environmentally friendlier fire retardant can be created.