Highly Efficient Microwave assisted Formation of Sulfonium Photoacid Generators (PGAs) for use in Photolithography and Coatings Applications

Advantages
• Uniformly higher yields than conventional thermal methods
• Significantly faster reaction time, reduced from about 20 hours to approximately 6-10 minutes
• Significantly lower energy consumption and production cost

Invention
Fast, highly efficient method to prepare commercially important sulfonium salt photoacid generators (PAGs) using microwave-assisted reactions.

Background
Chemically amplified resist technology, is one important step towards achieving the demand for further enhancement of semiconductor density, integration, and operational speed. In chemically amplified resist technologies, the radiation-sensitive material (resist) typically includes a matrix polymer and a Photoacid Generator (PAG). Both components have great influence on the photoresist performance. Due to their great potential for use in the photolithography and coating industries, sulfonium salts are employed in semiconductor materials as a PAG for chemically amplified photoresists. However, the methodology currently in use to prepare such commercially important sulfonium PAGs lacks efficiency and high yield.

To overcome such problems, UCF scientists have developed a fast and highly efficient method to prepare sulfonium photoacid generators (PAGs) by using microwave-assisted reactions. Microwave heating significantly reduces reaction times, resulting in reactions 90 to 420 times faster than conventional methods. This allows for a more energy efficient and cost effective formation of sulfonium PAGs. In addition, significantly higher photoacid quantum yields of new sulfonium PAGs are achieved. Through this novel invention, commercial manufacturers of sulfonium PAGs can prepare them faster, easier and more efficiently, while realizing production energy cost savings.

Application
This novel technology can be applied to commercial manufactures of sulfonium PAGs for use in the photolithography and coatings industries.

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Selected References

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