Tricyclononenes: New Alicyclic Monomers for 157 nm Photoresists

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Norbornene Copolymers for 157 nm Photoresists

Features of Norbornene Copolymers
- Isolation yield: 80-90%
- COOMe
- COOtBu
- F
- CF3
- CF3F3C
- Hydrofluorination
- Clean reaction, high yield, easy purification
- Increases transparency of the ester
- Electron withdrawing groups further away from double bond
- Electron withdrawing groups
- VASE Analysis of Polymers
- Increased fluorine content decreases absorbance of ester monomer at 157 nm
- Functional resist copolymers using TCN monomers show good transparency at 157 nm and are being evaluated for imaging performance

Tricyclononene Chemistry

Benefits of TCN Chemistry:
- Electron withdrawing groups positioned further away from double bond
- Easy synthesis and purification
- Compatible with a wide range of alkene and alkyne starting materials
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Fluorinated TCN Monomers

Infrared loading: 80-90%
- Isolation yield: 60-90%
- Clean reaction, high yield, easy purification
- Higher fluorine content...but lower yield
- Currently, optimizing conditions to improve yield
- Monomer difficult to polymerize using cationic nickel and palladium catalysts

Conclusions

Tricyclononene monomers offer a route to vinyl addition polymers containing esters with α-CF3 groups.
- V-UV and VASE analysis on model monomeric and polymeric TCN systems indicate promising transparency at 157 nm.
- Functional resist copolymers using TCN monomers show good transparency at 157 nm and are being evaluated for imaging performance.
- More heavily fluorinated TCN copolymers are being synthesized with the potential for increased transparency.
- Additional TCN-based monomers are being evaluated for resist consumers.

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