NEW ONE-COMPONENT IODONIUM PHOTOINITIATORS WITH ADVANCED CHROMOPHORES FOR CATIONIC VAT 3D-PRINTING

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Vat 3D printing is an excellent alternative to traditionally preparing polymer 3D objects, reducing costs, and increasing the resolution of the objects. However, the application of cationic vat 3D printing is still limited by a number of inconveniences such as the lack of suitable photoinitiators absorbing in the emission range of light sources used in printers (about 405 nm).[1]

The most commonly used iodonium salts are diaryl derivatives proposed by Crivello in the 70s. They absorb poorly above 300 nm and need photosensitizers or special light sources to initiate polymerization efficiently.[2] Therefore, the development of advanced iodonium salts that absorb in the longer wavelengths is essential. They must also efficiently generate super acid.

Our new innovative chromophore designs allow iodonium salts to be obtained in a selective manner which was previously impossible for the more sophisticated chromophores.[3] Moreover, a double bond was used in these chromophores, and, among others, we obtained the first symmetric iodonium salts containing such moiety.[4] Such advances in the structure of iodonium salts (possible by our design) have produced compounds with excellent absorption properties reaching into the visible range. These new iodonium salts are able to photolyze efficiently at 365 nm and 405 nm LED irradiation and can photoinitiate the cationic polymerization process of such monomers as epoxides and vinyl ethers. It was possible to study the substituent effects due to the easily modifiable structure of the chromophore, which allowed for a better understanding of sophisticated iodonium salt properties. This design leads to a great improvement in photoinitiating properties so that our salts can be used in such advanced applications as cationic vat 3D printing.

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