New Generation of Oxime-ester Photoinitiators: Unveiling New Structures, Mechanisms, and Applications

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Oxime-ester photoinitiators are currently the most popularly used photoinitiators in color photoresists, which are critical for modern microelectronics industry. Therefore, to develop an efficient strategy to design highly photosensitive oxime-ester photoinitiators has been a hot research topic worldwide[1-2]. One promising method to enhance the photosensitivity of oxime-esters is to increase the quantum yield of the active free radicals. However, the traditional oxime-esters, after absorbing one photon, can produce only one active free radical because the generated iminyl radical is unable to initiate polymerization of acrylates. Therefore, the limiting value of the quantum yield of active free radicals is 1. We propose a new approach to boost the quantum yield of active free radicals based on photoinduced free radical transfer mechanism. With elaborate molecular design, the formed iminyl radicals with low initiation activity can be converted to alkyl radicals with strong initiation ability via intermolecular cyclization or ring-opening reactions. Therefore, the maximum quantum yield of the active free radicals could be raised from 1 to 2, effectively enhancing the initiating efficiency compared to conventional oxime-ester photoinitiators.

References

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