

HIGHLY CONJUGATED VISIBLE AND NEAR-INFRARED LIGHT PHOTOINITIATING SYSTEMS

Kerem Kaya^a, Ali Suerkan^a, Ecem Aydan Alkan^b, Yasemin Arslan Udum^c,
Levent Toppare^{b,*}, Yusuf Yagci^a

^a Department of Chemistry, Istanbul Technical University, Maslak,
Istanbul, Turkey, 34469

^b Department of Polymer Science and Technology, Middle East Technical University,
Ankara, Turkey, 06800

^c Technical Sciences Vocational School, Gazi University, Ankara 06500, Turkey

Here, we report the use of highly conjugated thiophenes having [1,2,5]-thiadiazolo and [1,2,5]-selenadiazolo [3,4-*f*]-benzo [1,2,3] triazole in the presence of diphenyliodonium hexafluorophosphate salt (DPI) under incandescent near-infrared (NIR) lamp irradiation as new visible and near-infrared light (NIR) photoinitiator systems for free radical (FRP) and cationic polymerizations (CP). The proposed mechanism is based on the photoinduced electron transfer (PET) reactions between the excited conjugated thiophenes and DPI ions. The radicals and Bronsted acid generated by PET reactions initiate FRP and CP of appropriate monomers such as methylacrylate (MA), methyl methacrylate (MMA), triethylene glycol dimethacrylate (TEGDMA) and cyclohexene oxide (CHO), isobutyl vinyl ether (IBVE) respectively. The possibility of *in situ* hybrid polymerization is demonstrated using bifunctional monomer glycidyl methacrylate (GMA). The superiority of NIR irradiation over UV irradiation is also demonstrated by comparing DMA (Dynamic Mechanical Analysis) of polymer films formed under UV and NIR light.