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Fabrication of Organic Nanofibers via Electrospinning

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10,12-Pentacosadiynoic acid (PCDA) monomers were successfully embedded in poly(Ɛ-caprolactone) (PCL) polymer matrix via electrospinning for the first time. The resulting EFM was UV-irradiated to form Polydiacetylene (PDA) polymer within the mat. The PCL/PDA EFM enables colorimetric identification of fake and polluted gasoline in comparison to the pure gasoline. It develops a red color mat in fake and polluted gasoline samples within 5 s. In comparison to the PCL/PDA EFM, PCL/PDA spin coated film failed to detect fake gasoline.
Similarly, a photochromic spiropyran dye [1'-3'- Dihydro-1',3',3'- trimethyl-6-nitrospiro[2H-1- benzopyran-2,2'- (2H)-Indole] (Indole) was successfully embedded as a guest into a host PCL polymer matrix via electrospinning for the first time. The resulting PCL/Indole EFM have good photo-switching properties upon alternating ultraviolet and visible light irradiations. We found that patterned color image can be recorded on the photochromic PCL/Indole EFM using photo-masked UV irradiation. The subsequent visible light irradiation of the mat completely erased the recorded patterned color image. Series of novel PCL/Cellulose Acetate (CA) ENMs were prepared via electrospinning. PCL/CA ENMs were further treated in an aqueous alkaline solution to convert CA into Cellulose (CEL). The novel PCL/CEL EFMs showed improved wetting properties. The PCL/CEL, (1:4) blend exhibited the most uniform and fast wicking rate demonstrating that they can be used in applications including liquid biofilter and biosensor strip. Also, a series of novel Zein/CA EFMs was electrospun and their properties were characterized. Significantly, improved thermal properties including higher glass transition temperature (Tg) and higher degradation temperature (T D) were revealed for Zein/CA EFMs in comparison to the pure Zein EFM. Furthermore, Zein/CA EFMs showed hydrophilic surface characteristics with very low water contact angle (WCA) values suggesting that they can also be used as a scaffold in tissue engineering and as a liquid biofilter and/or biosensor strip.

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