Could liquid crystal polymers help saving the planet?

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Controlling sunlight reaching the Earth is perceived to be key to mitigating rise in Earth's temperature. Unfortunately, or maybe, fortunately, the Sun is too far away and radiates in too wide a spectral range for current technology solutions of controlling light. Proposed solutions include, essentially, contaminating the waters and the atmosphere with particles that would reflect the sunlight back to the Universe… A cleaner solution, essentially, a sunshade positioned at the L1 point was deemed technologically impossible and financially prohibitive due to the weight of a sunshade as large as Florida and the cost of rocket launches… Both factors are fast becoming surmountable due to achievements in space exploration technologies on one hand and development of ultralight diffractive optics highly efficient in broad bands of spectra on the other hand. We will show that the so-called 4th generation of optics that utilizes geometrical phase modulation in (sub)micrometer-thin liquid crystal polymer (LCP) films could selectively redirect a portion of sunlight in undesirable parts of spectrum away from the earth while allowing fast, low-cost and green fabrication with small material requirements. Only 3% of global economic output for one year is estimated to be needed to launch the necessary optical film into space. Moreover, large LCP lenses, prisms and ultrathin/ultralight films with widest variety of optical functions may enable providing essentially unlimited clean energy to Earth by beaming the energy harvested from sunlight in space.

Biography:

Dr. Nelson Tabiryan received a Ph.D. degree in Physics and Mathematics from the Institute of Physical Investigations of the Armenian Academy of Sciences (1982), and D. Sc. Degree from the Highest Certifying Commission of the USSR (1986). Dr. Tabiryan is OSA Fellow, NIAC (NASA) Fellow, Alexander Von Humboldt Research Scholar, recipient of the Frederiks Medal, and the American Chemical Society's Cooperative Research Award (2013, with T.J. Bunning and T.J. White). He is a chairman, program committee member, keynote and invited speaker in numerous conferences. He has over 250 refereed publications and 50 awarded patents.

Dr. Tabiryan pioneered a breakthrough by developing technology that overcomes limitations of conventional optics - refractive, diffractive, meta - in size, weight, transparency, efficiency and bandwidth. The so-called Fourth Generation Optics makes possible fabrication of even large aperture optical components in fast, inexpensive, and green manufacturing processes utilizing only grams of material per meters of optical aperture and bringing in the era of custom optics with same day delivery! Ultralight large thin film optical systems, fixed or switchable, enable novel applications from space exploration and power beaming to versatile imaging system, including LiDARs and augmented reality glasses, operating with low-power requirements without mechanically moving parts.