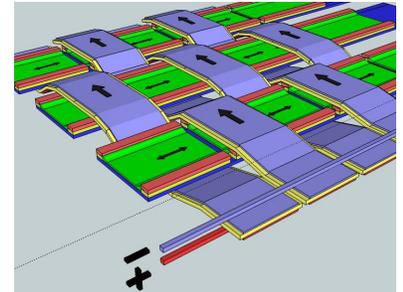




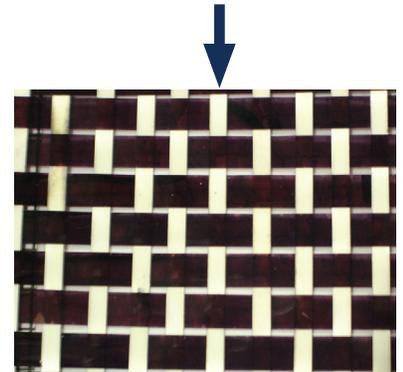
## NEXT GENERATION PHOTOVOLTAIC EFFORTS

### ADVANCED WOVEN PHOTOVOLTAICS (PV)

Advanced woven photovoltaics (PV) are the next step in a natural progression towards the realization of power producing textiles. By producing discreet tapes of working PV material, and then weaving those tapes together using machinery modified to accept a tape format, the potential for large scale production of a more flexible & conformal PV "textile" becomes highly probable. To date, a small handful of hand woven swatches of working PV tapes have been produced under a American Reinvestment and Recovery Act (ARRA) funded effort. This initial success will require further effort to pursue refinement of the tape geometry, environmental protection of the PV tapes (e.g. moisture, oxygen, abrasion, etc.), increase in photon conversion efficiency, along with improved materials selection and rear metalized electrode focus.



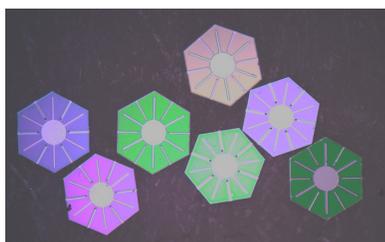
Concept drawing



Woven PV that offers improved flexibility over planar versions

### COLORIZED PHOTOVOLTAICS (PV)

Colorized photovoltaics (PV) offer the potential to allow an established alternative energy source to mimic the color and pattern of virtually any camouflage or naturally occurring shape. While this technology is still very much in its' infancy, basic component PV cells have been produced with perceived colors ranging from light skin tones, to light & dark greens, purples, and blues. Since the perception of color is essentially the human analysis of light energy (i.e. photons) reflected by the item being looked at, that reflected light will also equate to some level of energy conversion loss by the PV itself since those photons are not available to generate electrons within the PV itself. As a result, the level of energy actually converted will depend upon both the energy of the photons reflected (i.e. the perceived color), as well as the spectral conversion efficiency of the PV for that / those wavelength(s). Further, since the energy level available will be dictated by the color of the PV cells, like colored cells will need to be linked together, before being linked with other strings of like colored cells to obtain maximum power output from a multi-colored / camouflage swatch. All of this work, to include durability, conversion efficiency increase, and scale-up of the technology to higher levels of production, will need to be addressed over the course of this program.



Individual colorized PV micro-cells



Active PV camouflage



Mimic naturally occurring shapes

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