Transmission modulation through sub-wavelength hole arrays in metal-VO$_2$ double-layer nanostructures J. Y. SUH, E. U. DONEV, R. LOPEZ, L. C. FELDMAN, R. F. HAGLUND JR., Vanderbilt University — Nanoscale optical systems require active devices able to control light in sub-wavelength structures. We report the use of a unique double layer structure which provides this function. Enhanced transmission of near-infrared light through a sub-wavelength hole arrays patterned in Ag-VO$_2$ and Au-VO$_2$ double-layer films shows that it is possible to modulate transmitted intensity by means of a semiconductor-to-metal phase transition in VO$_2$. The transmitted intensity in the near-infrared for the metallic phase of VO$_2$ is a factor of $\sim 10$ greater than the intensity for the semiconducting phase. We explain this modulation in terms of the switchable permittivity difference of the VO$_2$ phases.