This readme file gives information about the raw and processed data used in the paper “***A non-volatile chalcogenide switchable hyperbolic metamaterial***”. Stated below are the details of the figures in the paper, starting with figure captions and then the description of the files containing the raw and processed data used in these figures.

1. *Figure 2 - (A) Real and (B) imaginary parts of the effective dielectric constants and of the HMM extracted from ellipsometry, with GST layers in the amorphous (top panel) and crystalline (bottom panel) phases. The shaded part indicates the region of hyperbolic dispersion.*

The raw data were ‘psi’ and ‘delta’ collected by carrying out ellipsometry measurements on the amorphous and crystalline HMMs. In addition to the ellipsometry data, angle resolved reflectivity spectra measurements were also done on both the samples. The dielectric constants in this figure were obtained by modelling the ellipsometry data as well as the reflectivity spectrum data using a uniaxial anisotropic model. The data analysis and modelling were done using the J. A. Woollam VASE ellipsometry data analysis program. The raw ellipsometry and reflection data, the uniaxial anisotropic model, the fitted data as well as the retrieved dielectric constants are contained in the files “gst-amorphous-hmm\_step2\_model-fit1\_v5\_with\_reflection.env” and, “gstcrysalline-hmm\_step2-model1fit1p2\_v2\_with\_reflection.env”, for the amorphous and crystalline HMMs, respectively. These files can be opened with the J. A. Woollam VASE ellipsometry data analysis program.

1. *Figure 3 - Experimental (top panel) and calculated (bottom panel) reflection spectra as a function of angle for TM polarized light incident on the HMM, with GST layers in the (A) amorphous, and (B) crystalline phases.*

The experimental reflection data and the calculated data are both contained in the .env files mentioned above, in the context of Figure 2.

1. *Figure 4 - Colour map of the electric field amplitude and the direction of power flow for TM polarized plane wave incident at an angle of 60o on the (A) amorphous HMM and (B) crystalline HMM, at a wavelength of 1200 nm. The HMM is highlighted by white dashed lines. Spectral regime of negative refraction moves from NIR to visible by switching the phase of the GST layers from amorphous to crystalline. The simulations were performed using the experimentally determined dielectric constants of the HMM.*

The color maps in this figure were obtained by carrying out finite element method (FEM) simulations in COMSOL. The COMSOL files “HMM\_amorphous\_negative\_refraction\_v3.mph” , and “HMM\_crystalline\_positive\_refraction\_1200nm\_v2.mph” can be used to generate the color maps shown in the figure for amorphous and crystalline HMMs, respectively.

1. *Figure 5 - Real (blue) and imaginary (red) parts of the dielectric function of (A) GST and (C) intermix layers in the amorphous (solid lines) and crystalline (dashed lines) HMMs determined from the transfer matrix model. Inset of figure C shows a schematic of a single period of the layered structure with the intermix layer used in the modeling. Color maps of the angle-resolved reflection spectra for TM polarized light incident on the (B) amorphous and (D) crystalline HMMs calculated using the transfer matrix model.*

The dielectric functions of the GST and intermix layers were obtained by using a transfer matrix method to model the layered HMM structure, keeping the dielectric constants of GST and the thickness of the intermix layer as the fit parameters. This analysis was done using the J. A. Woollam CompleteEASE ellipsometry data analysis program. The raw ellipsometry data, the transfer matrix model used for the analysis, the parameters used in the model as well as the retrieved values of the GST dielectric constants and the thickness of the intermix layer are contained in the files, “GST\_HMM\_7PERIOD\_OLDTARGET\_AMORPHOUS\_model10 (starting point=GST\_24nm\_old target\_Amorphous\_model2\_fit1\_NK)\_GST and Ag varied\_fit1.SEsnap” and, “GST\_HMM\_7PERIOD\_OLDTARGET\_CRYSTALLINE\_model9B (starting point=GST\_24nm\_old target\_Crystalline\_model3\_fit1\_NK)\_GST and intermix varied\_fit1.SEsnap”, for the amorphous and crystalline HMMs respectively. These files can be opened using the J. A. Woollam CompleteEASE ellipsometry data analysis program.

The calculated reflection spectra shown in Figures 5(B) and 5(D) were determined using a transfer matrix methodology, using the dielectric constants and thicknesses of the individual layers in the MATLAB code by name “multi\_layer\_spectra1\_GST\_Ag\_Ge\_v3.m”.

1. *Supplementary Figure S1 - Experimental (top panel) and calculated (middle, bottom panels) reflection spectra as a function of angle for TE polarized light incident on the HMM, with GST layers in the (A) amorphous, and (B) crystalline phases.*

The experimental data and calculated data (middle panel) are available in the .env files described in (1). The calculated data in the bottom panel were determined by using a transfer matrxix methodology using the MATLAB code “multi\_layer\_spectra1\_GST\_Ag\_Ge\_v3.m” as described in the discussion of Figure 5.

1. *Supplementary Figure S2 - (A) Real and (B) imaginary parts of the effective dielectric constants and of the HMM calculated using effective medium theory, with GST layers in the amorphous (top panel) and crystalline (bottom panel) phases.*

These were calculated using effective medium theory formulas written into the MATLAB code “MMeps1\_GST\_Ag\_fabricated.m”. The input parameters include the thicknesses of the Ge, GST, Ag, and intermix layers which are incorporated into the code as well the refractive indices/dielectric constants of these materials which are included as .txt files in the folder containing the MATLAB code.

1. *Supplementary Figure S3 - Spectral dispersion of the real and imaginary parts of the dielectric constants of (A) Ag and, (B) Ge layers used in the transfer matrix model.*

These values were taken from the database of the ellipsometry data analysis programs used in this paper. The same values are included as .txt files “Ag\_Palik\_CompEASE.txt” and “Ge\_Palik\_WVASE.txt” in the folder containing the MATLAB codes.

**Date of data collection:** from August 2015 - December 2017.

**Information about geographic location of data collection:** University of Southampton, U.K., and Nanyang Technological University, Singapore.

**Date that the file was created:** July 2018