Supplemental Document

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Sb_2S_3-based optical switch exploiting the Brewster angle phenomenon [Invited]: supplement

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Optical Switch Based on the Brewster Angle Phenomenon using Sb_2S_3

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1. Supplementary Information

Here, we present the collection of raw experimental data measured for both samples. In Figure 1, different measurements of spectral reflectance taken from various parts of the samples are shown. Variations in the positions of the peaks/minima indicate slight changes in the thickness of the film. In Figure 2, angular reflectance measurements are plotted (3 for each sample). Figure 3a clearly shows that the Brewster angle does not appear to be well-defined experimentally. This phenomenon has led us to consider that the angular reflectance curve strongly depends on the incident light's polarization being truly p-polarization to the plane of incidence. Therefore, by simulating variations in the percentage of p-polarization in favor of s-polarization (Figure 3ac), we can observe how the definition of a reflectance minimum is highly sensitive to the presence of s-polarization in the case of the amorphous sample. In fact, it is determined (Figure 3b) that for the amorphous sample, the angular reflectance was measured with approximately 10% of s-polarization. Figures 4a,b show reflectance (experimental and simulated) for an incident angle (θ = 55º) and for both phases (amorphous and crystalline) as a function of the wavelength.

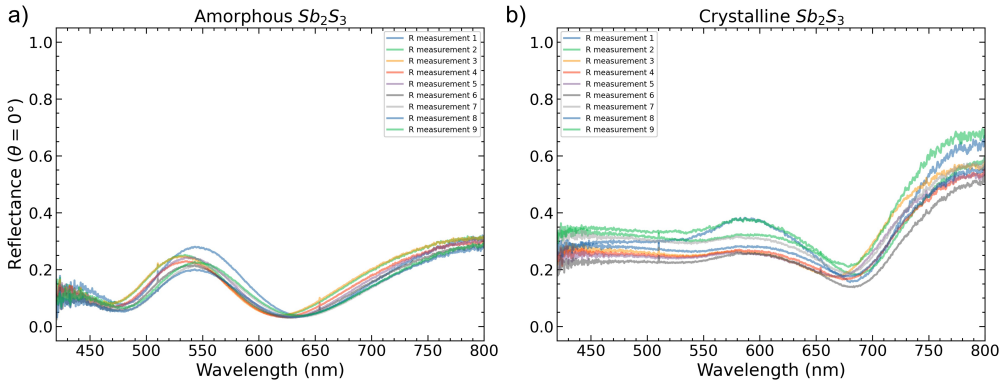

Fig. 1. Spectral reflectance measurement of amorphous (a) and crystalline (b) Sb_2S_3. Measurements were taken for normal incidence with a 10x objective and $NA = 0.3$. Nine measurements were taken for each sample in different areas.

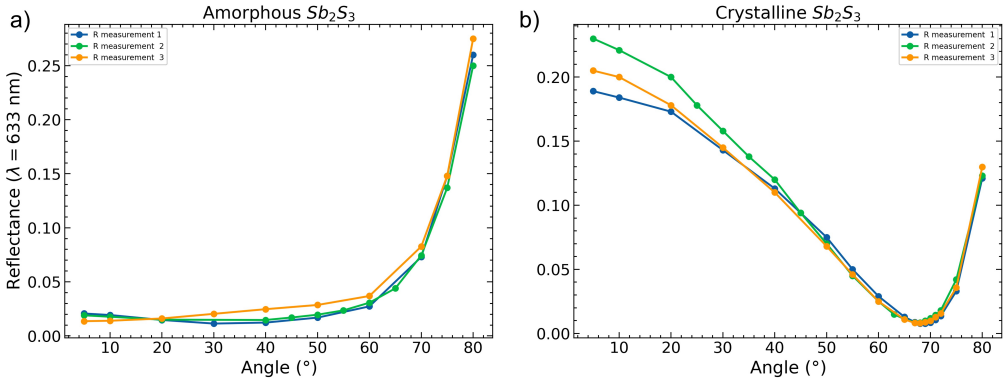

Fig. 2. Angular reflectance measurements of amorphous (a) and crystalline (b) Sb_2S_3 at a Helium-Neon laser wavelength of $\lambda = 633$ nm. Three measurements were taken for each sample in different areas.

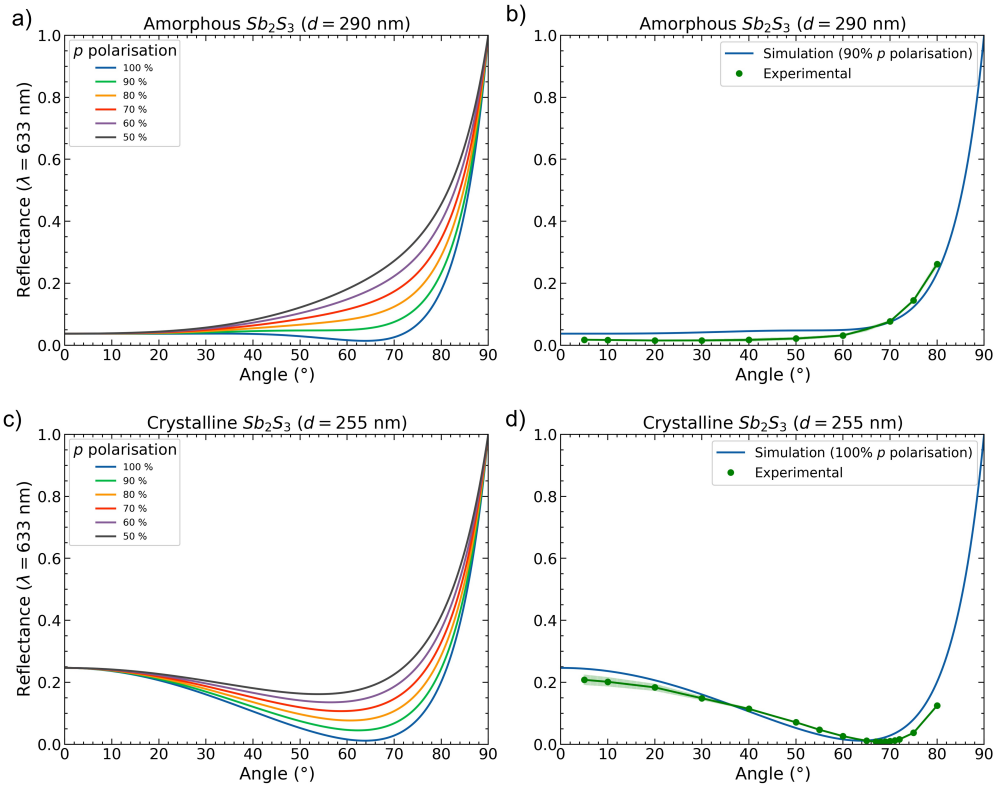

Fig. 3. Simulated angular reflectance curves at $\lambda = 633$ nm for amorphous Sb_2S_3 (a) and crystalline (c), varying the amount of p-polarization incident on the sample. It was found that for the amorphous Sb_2S_3 measurements (b), the curve that best fits the data corresponds to 90% p-polarization, which is the reason why a well-defined Brewster angle is not observed in the experimental curve. In the case of the crystalline sample (d), the experimental curve fits well with pure p-polarization incidence.

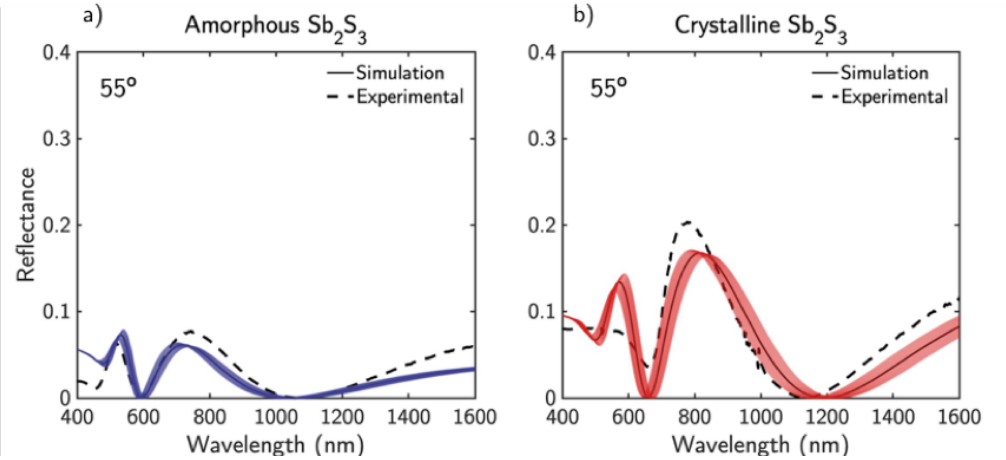

Fig. 4. Reflectance (experimental and simulated) for an incident angle (θ = 55º) and for both phases (a) amorphous and (b) crystalline as a function of the wavelength. In simulations, the continuous black line represents the average reflectivity, while the color thickness indicates the standard deviation.