High-reflectance Al mirrors protected with hot-deposited MgF2 or AlF3

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The Far UV (FUV, 100-200nm) range is of great interest to the communities of astrophysics, solar physics, as well as atmosphere physics. Spectral lines of many fundamental atom and ion species of H, C, N, O, etc. lie in this range. Future space observatories will benefit from more efficient and stable FUV mirrors. Aluminum is the material of choice to efficiently reflect a broad spectrum extended to the FUV. Nonetheless, the surface of Al films swiftly oxidizes after contact with air, which strongly reduces reflectance; therefore, a protective layer is necessary to avoid oxidation and maintain high reflectance over time. MgF2 and, more recently, AlF3 are transparent materials that can be used to protect the Al film from oxidation while keeping a high FUV reflectance due to their transparency down to 115 nm (MgF2) and 113nm (AlF3). The protective fluoride layer has been routinely deposited at room temperature, until it has been demonstrated that a reflectance increase is obtained when a higher temperature is used. In this poster, we report our work on the optimization of the deposition temperature of the MgF2 and AlF3 protective film. The reflectivity, stability over time, and morphology of MgF2 and AlF3 protected Al mirrors have been investigated as a function of deposition temperature. It was found that the optimum deposition temperature for both MgF2 and ALF3 ranges between 200 and 250 °C. Structural data on roughness, density, grain size and main crystal orientations of protected Al mirrors is presented. These results were obtained through atomic force microscopy, X-ray reflectometry, θ-2θ (Bragg-Bentano) X-ray diffraction, and grazing incidence X-ray diffraction.