HIGH REFLECTANCE OPTICAL THIN FILM GRATING LIGHT VALVE

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Micro-Electro-Mechanical-Systems (MEMS) is a technology that has made remarkable progress during the past ten years. Application of MEMS in optical systems, which is known as optical MEMS, has initiated the new category of MOEMS (Micro-Opto-Electro-Mechanical-Systems) enabled us to combine the mechanical, electrical and optical components in very small scale. The significant impact of MOEMS in display technology has resulted in a well controlled diffractive optical display device called Grating Light Valve (GLV). This is a programmable diffraction phase grating, that operates on the electrostatic defelction of micro beams formed of moving parts on the surface of a silicon chip. Each GLV element consists of (typically) six dual-supported parallel ribbons formed of silicon nitride (Si_3N_4) and coated with a reflective very thin top layer of aluminium. The optical efficiency of the GLV device is the product of diffraction efficiency, fill factor efficiency and the reflectivity of the top layer. The overall device efficiency is about 70%, corresponding to an insertion loss of about 1.5dB. Reflectivity of the top layer depends on the choice of material selected. This paper presents approaches to achieve high reflective Grating Light Valve. In visible spectral regions, a dielectric multilayer can be used to enhance the reflectivity based on the optical interference effect in Grating Light Valve. In our paper aluminium is used as a metal sub-layer. By coating a dielectric stack over this layer will further enhance the reflectivity of the device over a wide range of wavelengths. Here, the stack comprises of low and a high reflective layer of low and high refractive index materials SiO_2 and HfO_2 respectively. The effect is found to be much better than conventional method of sealing in a dry nitrogen environment.