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STUDY OF THIN TELESCOPIC MIRROR FABRICATION AND MIRROR CELL OPTIMIZATION

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ABSTRACT

In conventional telescope mirror grinding standards it is required to maintain thickness to diameter ratio greater than 1/6.Mirrors with the ratio less than 1/6 are considered as thin mirrors. Mirror blanks are selected considering this factor which causes to increase weight of the mirror blank significantly. It will increase the cost of the mirror blanks and effect thermal behavior of the telescope adversely. Thin mirror blanks are considered to bend because of the pressure applied in the conventional grinding process. Also there is a tendency of bending of thin mirrors when mounted in telescopes. Therefore, it requires an optimized axial support. Thickest glass available locally is 0.015m. The largest mirror (having ratio 1/6) possible to make from this thickness is limited to 0.09mdiameter. Main objective of this research is to grind a 0.25 m diameter mirror using 0.015 m thick Soda Lime glass. For the mirror design, higher focal length of 2.5 m was selected to reduce the depth of the curvature. The conventional mirror grinding process was modified to minimize the pressure applied on the mirror blank and the mirror was thermally treated to reduce the deformation. Curvature grinded using this method was tested using Ronchi Test. Special objective of this research is to fabricate an optimized axial support to hold the thin mirror in the telescope without deforming under gravitational loading. Dimensions of the axial support were calculated using Plate Optimizing (PLOP) software which uses numerical methods to find the optimum supporting locations. Graphical representation of deformations due to fabricated axial support was generated using PLOP and Root Mean Square (RMS) value of the deformation was calculated. We have successfully fabricated a thin mirror with an optimized axial support for astronomical telescopes using locally available glass.

Keywords: Telescope mirror grinding, thin mirror, Ronchi test, Optimized axial support