

PARABOLIC TROUGH CONCENTRATOR MADE WITH FIRST SURFACE ALUMINUM GLASS MIRRORS

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It was possible to build sections of first surface glass mirrors of 30 x 60 cm with parabolic trough profiles in order to get a kind of mosaics. Using these mosaic segments, it was possible to get a parabolic trough concentrator with an aperture of 2.37 m and 1.14 m long.

Using the following methodology was possible to get such concentrator. A male mold with parabolic trough geometry previously fabricated with stainless steel sheet described by Almanza *et al.* 1982, was used to get small segments of mass-rock[®], a mexican material which is a combination of pozzolan, synthetical and natural microfibers, and cementitious materials. When such material is hydrated, its behavior has a very easy molding behavior. Mass-rock segments (female) were built over the male mold. Along the hardening of this material, no deformation was detected and such material works up to 800°C almost without any deformation .

Float soda-lime glass was used as substrate and the trough glass segments were fabricated by thermally sagged method up to 600°C over the female mass-rock[®] molds. To this temperature, the glass can get the parabolic geometry and conserve its smoothness when they are inside the oven between 20 and 60 minutes, depending on the number of glasses inside of such divide.

Aluminum first surface glass mirrors were built with these mosaics using sputtering technique as it has been described by Almanza *et al.*, 1995, Correa *et al* and Almanza *et al* 1999.

Sixteen mosaics mirrors were fabricated using two magnetrons, one with aluminum target and the other with SiO₂ target. The evaporation of the aluminum was about up to 1000 Å thickness layer, while SiO₂ was about 3000 Å. The aluminum evaporation was carried out under an argon plasma, while the SiO₂ was with an argon-oxygen plasma (70-30%). This last aspect is necessary in order to keep the stoichiometry. The specular reflectance of these mirrors are of the order of 86%.

The field tests focusing such concentrator on photovoltaic cells gave a size of the focus of about 6 cm, so over 90% of the beam solar irradiance arrive on a pipe receiver of 6 cm diameter.

References

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