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Black aluminium thin films prepared by magnetron sputtering

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Black aluminium thin films were prepared by means of pulsed DC magnetron sputtering. The films were deposited from pure aluminium target and their properties modification is reached by proper variation of deposition conditions, such as adding nitrogen to argon working gas of partial pressure from $5 \cdot 10^{-4}$ Pa to $2 \cdot 10^{-2}$ Pa. The total pressure varied from 0.1 Pa to 10 Pa. The deposited black aluminium thin films exhibit, due to specific surface micro-nanostructure, excellent absorptivity in UV-VIS-IR electromagnetic radiation spectral regions. The evolution of the film properties with thickness and temperature was examined. The film properties were characterized by spectrophotometry, AFM, SEM, XRD, photoelectron spectroscopy and positron annihilation spectroscopy.

The deposition method allows effective, low cost fabrication of the coating on several kinds of substrates (eg. glass, fused silica, quartz, copper and stainless steel) and it is also suitable for large area substrates coating. The coating could find application as absorbers of electromagnetic radiation, plasmonics, detectors and chemical sensors.

Keywords

magnetron sputtering
black aluminium
nitrogen
absorptive coating