Co-deposited Si-Al thin films as a base material to decrease the reflectance in the millimeter-band frequencies

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Formation of samples

The Si-Al films were deposited on 0.5 mm thick quartz slides by magnetron sputtering using the Angstrom NexDep setup with simultaneous operation of two magnetrons. The composition of thin films was varied by changing the power of the aluminum magnetron, the power of the silicon magnetron remained constant. Thickness of all Si-Al films were about 1 μm

Characterization of the samples

Surface morphology

The mean square roughness value for this sample from the first group is 12.77 nm. The mean square roughness value for this sample from the second group is 135.1 nm.

Reflectance in visible and near IR

- Co-deposited Si-Al alloy thin films can be divided into two groups: first group for the low Al content (below 17 at.%) and the second group for the high Al content (over 26 at.%)
- Samples from the first group have homogeneous composition while for second group samples a segregation of Al and Si is occurred
- First group samples are almost transparent in mm-band and near-IR band and suppose to be semiconductors
- Second group samples have high reflection in mm-band and near-IR band due to Al-enriched layer on the film surface
- Sample with intermediate Al content (about 23 at.%) shows low reflection in mm-band due to good impedance matching with ambient atmosphere
- Si-Al films with μm-scale thickness can be used as low-reflective coatings in mm-band

Conclusions

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