

1.12 Growth of COANP, PNP and MNBA on Inorganic Substrates by Organic Molecular Beam Epitaxy

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Thin films of the highly nonlinear optical organic compounds COANP (2-cyclooctylamino-5-nitropyridine), PNP (2-(N-prolinol)-5-nitropyridine), and MNBA (4'-nitrobenzylidene-3-acetamino-4-methoxy-aniline) have been deposited by organic molecular beam epitaxy. In view of potential applications the growth of organic nonlinear optical thin films on silicon substrates is of highest interest; furthermore growth experiments have been performed on mica, graphite, oxydised silicon and glass.

It was found that at low substrate temperatures ($T < 0^{\circ}\text{C}$) the grown organic films were generally uniform but amorphous. In the case of COANP films grown on silicon substrates a slow recrystallisation occurred upon the exposure to the ambient temperature and pressure; fairly large domains of several mm in diameter have been obtained in this way. Their orientation and crystallinity has been investigated by the optical process of Second Harmonic Generation.

At moderate substrate temperatures (room temperature) the grown layers were found to show polycrystalline structure due to weak substrate-layer interaction and the missing structural relationship. At higher substrate temperatures ($T > 50^{\circ}\text{C}$ for COANP and PNP, 100°C for MNBA) desorption became an essential parameter and eventually dominated the deposition process.

The above results stress the importance of an adequate lattice matched substrate for the production of macroscopically monocrystalline organic thin films.