Photonic 재로로서 페닐실리카 코팅막의 특성
Phenyl modified silica sol-gel films for photonics

Bok Yeop Ahn, Sang Il Seok, Joo Hyeun Kim, Mi Ae Lim
Advanced Materials Division, Korea Research Institute of Chemical Technology
(anby@pado.krict.re.kr)

The advent of photonic technologies in the field of communications and data transmission has been heavily increasing the demand in integrated optical (IO) circuits capable of accomplishing not only simple tasks like signal, but also more sophisticated functions like all-optical signal routing or active multiplexing/demultiplexing. In the last decade, sol-gel technology has been widely used to prepare optical materials. Sol-gel processes show many promises for the development of low-loss, high-performance glass integrated optical circuits. However, crack formation is likely to occur during heat treatment in thick gel films. In order to overcome the critical thickness limitation, the organic-modified silicate has been widely used. In this case coating matrices have been prepared from the organo-silanes of T structures, acidic catalyst, and the as-prepared gel films have been heat-treated below 200℃ to avoid the crack formation and the degradation of organic components. However, the films prepared in the acidic condition and the low heat temperature make the films contain high OH groups which is the major optical loss function. In this work, $C_6H_5SiO_{1.5}$ films were prepared on silicon substrate by sol-gel method using base catalyst in a PTMS/NH_4OH/H_2O/C_2H_5OH system. The sol showed spinable viscosity at 50 wt% of solid content, and neglectable viscosity change with time. The films were crack-free and transparent after curing at 450 ℃, and highly condensed to minimize OH content in $C_6H_5SiO_{1.5}$ networks. The effects of heat treatment of the films are characterized on the critical thickness, the chemical composition and the refractive indices by means of SEM, FT-IR, TGA, prism coupler, respectively.