

**FORMATION MECHANISM AND THERMAL-SOLVATION DYNAMICS OF COMPLEX FILMS:
ATOMIC FORCE MICROSCOPY**

REPOVSKÝ Daniel, JÁNÉ Eduard, VELIČ Dušan

Comenius University in Bratislava, Bratislava, Slovakia, EU

Abstract

A complex film formation, based on silane film and PVA/PVAc (polyvinyl alcohol/polyvinyl acetate) microspheres on glass fiber surface is determined by using atomic force microscopy (AFM). Silane strongly binds through the Si-O-Si bond to the glass surface providing the attachment mechanism as a coupling agent. The silane film then vertically penetrates in a honeycomb fashion from the glass surface through the deposited PVA/PVAc microspheres forming a hexagonal close pack structure. The silane film not only penetrates, but also deforms the spheres from a dispersion to a ellipsoidal shape on the surface. The silane film also moves PVA/PVAc microspheres in the process the complex film formation from the low silane concentration areas into the complex film area providing enough silane to stabilize the structure. Silane - PVA/PVAc complex film on glass fiber surface is studied also during thermal curing and water re-exposure by using AFM. The water re-exposure after 15 minutes 200 °C curing leads a re-containing water but without restored microsphere structure, due to the intramixing, leaving the silane - PVA/PVAc film not complex anymore.

Keywords: Chemisorption, glass fiber, polymer film, silanes, PVA/PVAc, microspheres, AFM

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