別　紙　1

# 論　文　の　内　容　の　要　旨

Nanostructured 2-D and 3-D Biocompatible Interfaces
by Phosphorylcholine Group-Functional Polymer
(ホスホリルコリン基機能化ポリマーを用いたナノ構造を有する
2-D、3-D バイオ界面の創製)

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There is a great interest for making "biocompatible interface" in the field of biomaterial. Nonspecific protein adsorption at a material surface triggers a series of biological reactions so that the production of bio-inertness has to be aimed as a first priority. Also, excellent bulk properties are required for the biocompatible interface. Present research has been made in the purpose to seek for a guide principle for constructing biocompatible interface based on the nanostructure of interfaces by two different approaches, e.g. surface modification (2-D) and hydrogel preparation (3-D). A phosphorylcholine functional polymer, PMPC, synthesized by the inspiration from cell membrane, was utilized for the preparation of such interfaces. In chapter 2, design for 2-D biocompatible interface was searched on the PMPC-grafted poly(dimethylsiloxanes) (PDMS) prepared by photoinduced polymerization. Graft density was controlled by experimental condition but also the chain density remarkably determined protein resistance. The protein adsorption was decreased to a bare minimum on the densest brush. These observations indicate that the PMPC-grafted surface provide only specific interaction with biomolecules. Whereas, the construction of the protein resistant interface never disturbs original bulk properties of substrate. In Chapter 3, nanostructured network and state of water in the PMPC hydrogels were investigated in order to thwart nonspecific adsorption of biomolecules while obtaining elasticity and sufficient mass diffusivity. The combination of monomer and crosslinker are important to control the crosslink distance and to prevent the formation of network inhomogeneity. The given content of crosslinker for the preparation of hydrogel is most determinant factor for the reduction of network inhomogeneity in all type of monomer and crosslinker. The water structure of the PMPC hydrogel was categorized into three types, e.g. free water, freezing bound water, and non-freezing bound water. The amount of these types of water structures was indicated to determine not only mass diffusivity but also interaction with biomolecules.