化学学报 2002 60 (7): 1284-1290 ISSN: 0567-7351 CN: 31-1320/06

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一种新的压电免疫传感器中生物分子固定化方法的研究

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收稿日期 修回日期 网络版发布日期 接受日期

摘要 生物分子固定化或传感界面设计技术是研制压电免疫传感器的关键之一。本文 结合自组装单分子膜（SAMs）和聚电解质静电吸附组装技术，提出了一种新的压电 免疫传感器中生物分子固定化方法，研制成一种检测补体C_3的压电免疫传感器。 先在石英晶振的金电极表面组装一层胱胺SAMs，再在膜上组装带相反电荷的聚苯磺 酸钠（PSS）单层膜，通过静电吸附作用固定抗体（抗原），实现对相应抗原（抗 体）的检测。利用扫描电镜技术，从形态上考察了晶振组装胱氨SAMs与PSS及固定补体C_3抗体后的表面形貌。研究了抗体的固定化条件，探讨了传感器采用这种固定化方法的响应与再生性能，并与戊二醛键合固定法进行比较。结果表明，这种固定化方法不仅对蛋白质类生物分子的固定化具有普适性，而且对所固定的生物分子 的活性影响小，传感器的响应的频移值大，灵敏度高，选择性和再生性能均较好。

关键词 胱胺 聚电解质 免疫测定 传感器

分类号 0646

Studies on a Novel Immobilization Method of Biomolecules for Piezoelectric Immunosensors

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Abstract The immobilization of biomolecules or the design technology of sensing interface is one of the key factors for piezoelectric immunosensors. In this paper, two technologies named as the self- assembled monolayers (SAMs) and the opposite-charged polyelectrolyte adsorption are combined for a novel immobilization of protein molecules applied to an immunosensor for detecting complement C_3 in human serum. An opposite-charged polystyrenesulfonate (PSS) layer forms on the cystamine (Cys) self-assembled monolayers (SAMs) on the surface of the quartz crystal microbalance (QCM) which electrostatically adsorbs antibodies of complement C_3 (anti-C_3) onto the QCM for immunoreacting complement C_3. The surface morphologies of the QCM were investigated by scanning electron microscopy (SEM) after being modified with Cys SAMs and PSS layer and then immobilizing anti- C_3, respectively. The conditions of self-assembling Cys SAMs and PSS layer as well as immobilizing anti-C_3 are optimized in detail. Compared to the glutaraldehyde binding approach, the antibodies immobilized by the PSS adsorption procedure present higher antibody activity in terms of greater frequency response to immunoreaction. It is found that this immunosensing system provides advantages of improved sensitivity, selectivity and reusability. The immobilization method developed here might offer a promising possibility in firmly immobilizing biomolecules for biosensors.

Key words CYSTAMINE POLYELECTROLYTE IMMUNOASSAY SENSORS

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