

Novel Protein Quantification With Metal-Organic Framework (MOF)-Coated Quartz Crystal Microbalance (QCM)

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Interaction of Oligohistidine-tags(His-tag) with metal ions have long have been known and used for various purposes such as protein purification. Here, we conducted quantification of his-tagged Green Fluorescent Protein(GFP) by binding with Metal-Organic Framework (MOF)-coated Quartz Crystal Microbalance (QCM) sensor in order to reveal their possibility of selective protein quantification. QCM is capable of detecting nanogram-scale mass change with a simple procedure, giving immediate quantitative results. Especially, MOF-coated QCM is predicted to have increased efficiency in mass-change sensitivity. In this research, we selected MOF candidates with ligands that have coordinative sites, and those in which the metal ions(Ni, Co) consisting them are known to interact strongly with his-tags, and carried out His-tagged GFP binding. As a result, we concluded that UiO-67-bpydc are the most ideal MOF for binding, and developed a novel drop casting method for QCM sensor coating. Finally, we applied His-tagged GFP to the MOF film and observed its fluorescence with a UV microscope, having successful results. Furthermore, we carried out protein quantification with the GFP attached QCM sensor and found out that approximately 7.85µg of GFP were introduced. Moreover, we attempted a qualitative analysis in order to find out the type of interaction that GFP mainly forms with UiO-67-bpydc type MOFs with Imidazole, NaCl, n-Hexane elution, and concluded that His-tag coordination and Hydrophobic interactions usually occur between the MOF and His-tagged GFP.

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