レーザーアブレーションで合成したITOナノ粒子を用いたプラズモニック屈折率センサー

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Plasmonic refractive index sensors based on ITO nanoparticles synthesized by laser ablation
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Refractive index sensors based on localized surface plasmon resonance (LSPR) can be used for solid surface characterization and chemical sensing.[1)] The sensitivity of the refractive index sensing is known to increase as the resonance wavelength red-shifts. Since tin-doped indium oxide nanoparticles (ITO NPs), which are cost-effective and stable, exhibit LSPR in the near-infrared region, ITO NPs are suitable for refractive index sensors. However, ITO NPs have been synthesized in solutions in general,[2)] and therefore ligands on their surfaces tend to inhibit the sensing. In the present study, ligand-free ITO NPs were synthesized and simultaneously deposited on a solid substrate by laser ablation,[3)] and applied to refractive index sensing (Figure 1). Different types of ITO NPs were prepared under different conditions, and the refractive index sensitivity and figure of merit (FOM) were studied for evaluating sensor performances.
Keywords: Localized surface plasmon resonance; Plasmonic sensor; ITO nanoparticle

局在表面プラズモン共鳴（LSPR）に基づく屈折率センサーは、固体表面状態の評価や化学センシングなどに応用できる[1)]。その屈折率感度は一般に、共鳴波長が長波長になるほど高いと言われているので、近赤外線領域でLSPRを示し、貴金属と比較して安価であり化学的にも安定なスズドープ酸化インジウム（ITO）ナノ粒子の応用が期待できる。しかしながら、従来のITOナノ粒子[2)]は主に溶液中で合成されるため、表面の有機保護剤がセンシングを阻害する傾向がある。本研究では、レーザーアブレーション法で保護剤フリーITOナノ粒子を合成すると同時に固体基板に担持し[3)]、屈折率センシングに用いた（Figure 1）。異なるレーザー転写条件によりITOナノ粒子担持基板を作製し、それらの屈折率感度やFigure of merit (FOM)を調べることで、センシング特性についての評価を行った。

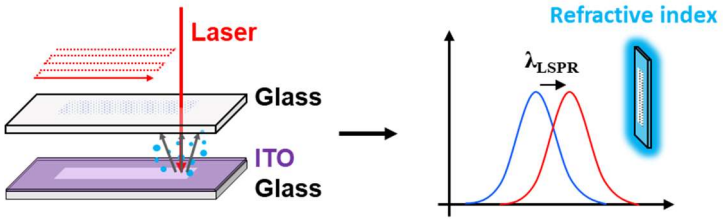

Figure 1. Preparation of ITO NPs and application to refractive index sensing.

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