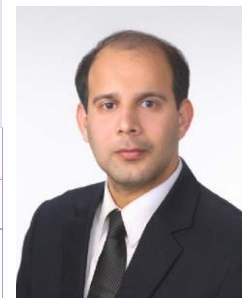
(Affiliations) 茨城工業高等専門学校
国際創造工学科 専門共通教育部

# X - ray Physics and Analysis Techniques: Investigation of atomic phenomena





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| Keywords | X-ray Total Reflection, XRF, XPS, SEM-EDX, XRR, Other Materials Analysis Techniques |
| Technical Support Skills 技術相談・提供可能技術 | ・SEM-EDX operation and data analysis<br>・XRF operation and data analysis<br>・XRR operation and data analysis, others |
| Message to the Industry 産業界へのメッセージ | I have been engaged in other themes apart from my field as a company researcher. This may include chemical encapsulation, vibration damping in industrial robotics, sensor optimization for diabetes noninvasive diagnosis, and crude oil refinery techniques. |

## Research Contents

Grazing incidence and grazing scattering X-ray analysis techniques have greatly been used in characterizing chemical and physical properties of materials recently. When an X-ray beam penetrates a material at below the critical angle, the X-ray beam is totally reflected providing less inelastic scattering, enhanced sensitivity and more detection limit. This phenomenon made the foundation for several techniques like grazing emission X-ray analysis, X-ray reflectivity (XRR), and total reflection X-ray photoelectron spectroscopy (TRXPS).

The phenomenon physics is associated with the behavior of electrons at the time of X-ray interaction with materials, including intrinsic and extrinsic contributions to a plasmon peak. Extrinsic and intrinsic contributions may be experimentally distinguishable for the plasmon peaks by the line width comparison. The relation between the surface and bulk plasmons at different exit and incidence angles may also provide an insight about surface and bulk plasmons at total reflection and non-total reflection conditions. Phenomena of X-ray physics and interactions are theoretically and experimentally studied, new techniques are proposed.

## Available Facilities and Equipment

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| X-ray Diffractometer | Raman Spectrometer |
| X-ray Fluorescence | |
| Nuclear Magnetic Resonator | |
| Electron Spin Resonance | |
| Scanning Electron Microscope-EDX | |