1. Principle of PIXE (Particle Induced X-ray Emission)

When Ion collides with atom, it radiates characteristic X-ray which is unique in each element. By detecting this X-ray, it turns out what elements and how many elements are included. The feature of PIXE is high detection sensitivity which is about ppm order.
2. Comparison between PIXE & EPMA

Electron beam is used in EPMA.

Using electron beam causes sequential X-ray which increases the noise level.

On the other hand, Ion beam is used in PIXE. Ion beam hardly causes sequential X-ray.

Therefore, PIXE has less noise level than EPMA.

This means that the detection accuracy in PIXE is better than in EPMA.
3. PIXE Analysis of TiAl<sub>6</sub>V<sub>4</sub> distribution into Bone

Distribution of Ti into Bone from implant surface was confirmed.
4. **PIXE Analysis of Ar concentration in Nb thin film**

Least bit of Ar is contained in Nb thin film because of Sputtering Process.
To detect Ar, two analysis Methods (PIXE vs ESCA) were compared.

**Ar was detected by PIXE.**
Concentration of Ar is $0.032 \pm 0.003\%$

**Ar was not detected by ESCA**
because of the surface oxidation

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**Fig. 1** PIXE Spectrum

**Fig. 2** ESCA(XPS) Spectrum
5. u-PIXE Analysis of Micronutrient in Hair

Analysis of Micronutrient in Perm Hair was tried with PIXE. Ion Beam was focused down to 30 um for the hair.

O, Na, Mg, Al, Si, S, Cl, K, Ca, Ti, Fe, Cu were detected in hair (Fig.2). In general, Ti is not contained in hair. This time, perm hair was used, therefore, Ti was detected.
6. Analysis of Optical Magnetic film by both RBS and PIXE

Samples: AlSiN (~ 400A) / FeTbCo(1000A) / Poly-Carbonate substrate

RBS was used to analyze the concentration of major elements. PIXE was used to analyze the concentration of minor elements. Combination of two methods realizes better analysis result.

\[
N_{Ar} = \frac{\sigma_{Fe} T_{Fe} N_{Fe} + \sigma_{Tb} T_{Tb} N_{Tb}}{\sigma_{Ar} T_{Ar}} \times \frac{S_{Ar}}{S_{Fe} + S_{Tb}}
\]

According to this equation, \(N_{Ar} = 0.30\) atm%
7. Detection Limitation of PIXE with standard Al sample

Detection Limitation of each element in standard Al sample was investigated.

According to PIXE spectrum (Fig. 1),
Detection Limitation of each element results in Fig. 2.

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**Fig. 1** PIXE Spectrum of standard Al

**Fig. 2** Detection Limitation of each element