

# TUTORAT UE3 2011-2012 – Physique

## Fiche Optique et Structure de la Matière

Préparée par l'ATMP

### I-Ondes :

#### • Onde Progressive (OP):

- =propagation dans un milieu infini d'une perturbation d'une ou plusieurs des caractéristiques physiques du milieu.
- > P sinusoïdale = OP dont la source génère une perturbation dont l'intensité varie sinusoïdalement.  
(A= amplitude ;  $\omega$  = pulsation propre en  $\text{rad.s}^{-1}$  ;  $f = \omega / 2\pi$  = fréquence en Hz ;  $T = 1 / f$  = période en s).
- > Toute onde périodique non pure est une somme d'ondes périodiques sinusoïdales.

#### • Modélisation :

- > Perturbation de la grandeur physique =  $E(x,t) = A \cdot \sin(\omega \cdot (t - x/c)) = A \cdot \sin(\omega \cdot t - k \cdot x)$
- > Phase =  $\phi = (\omega \cdot x)/c = (2\pi \cdot x)/\lambda$
- > Longueur d'onde =  $\lambda = cT = c/f = (2\pi \cdot c)/\omega$
- > Puissance surfacique =  $I = P/(4\pi \cdot r^2)$  = puissance / surface d'onde  
(puissance propre à la source  $\neq$  puissance surfacique qui  $\searrow$  lorsqu'on s'éloigne de la source)  
→ l'intensité d'une irradiation est inversement proportionnelle au carré de la distance qui sépare la source d'un sujet irradié.



#### • Onde stationnaire

- > Le milieu est limité et l'onde est confinée dans un espace de dimension D multiple de  $\lambda / 2$  → D est quantifiée.
- > La perturbation, qui est la somme de la perturbation induite et la perturbation réfléchiée, est nulle à tout instant.

**NB :** Dans le cas de l'onde d'un électron sur son orbitale, le milieu est de dimension D multiple de  $\lambda$  (et non  $\lambda / 2$ ).

$$E(x,t) = -2 \cdot A \cdot \sin(\phi) \cdot \cos(\omega \cdot t) = -2 \cdot A \cdot \sin((2\pi \cdot x)/\lambda) \cdot \cos(\omega \cdot t)$$



#### • Diffraction et interférences :

- > Lorsque une onde plane progressive traverse un orifice dont les dimensions sont de l'ordre de sa  $\lambda$ , il se forme des ondes sphériques! → c'est le phénomène de diffraction.
- > 2OPS de même  $\lambda$  sont cohérentes si leur différence de phase reste constante en tout point.
- > On observe lorsqu'on diffracte une onde par une fente de largeur b qu'il se forme sur un écran à distance de la fente une série de bandes éclairées, parallèle à la fente et de largeur  $2\lambda/b$  → phénomène d'interférences.

### II-Physique quantique :

#### • Hypothèses et conséquences :

##### > Hypothèse de base :

Le comportement de toute grandeur physique peut être modélisé de deux façons complémentaires : une modélisation ondulatoire (k) et une modélisation corpusculaire (p).

**Relation de Broglie :**  $\lambda = h/p$

(ex de l'électron :  $p = mv = \sqrt{(2 \cdot e \cdot m \cdot U)}$ )

# Optique Et Structure De La Matiere

**Daniela Niemeyer**



## **Optique Et Structure De La Matiere:**

**La structure de la matière, de l'énergie, et de l'espace physique** P. Drosne, 1922 *La structure de la matière*  
Instituts Solvay. Conseil de physique, 1921 Optique et structure de la matière, en résumé Jules Marcoux, 1981\*

Bulletin signalétique 160: Structure de la matière I - Physique de l'état condensé, physique atomique et moléculaire, spectroscopie ,1970 Optique et structure de la matière : physique 302 André Arès, Jules Marcoux, 1978 Matériaux - Physico-chimie des matériaux métalliques - Propriétés, traitements - Niveau B Nathalie Siredey-Schwaller, 2019-05-21 Cet ouvrage développe l'intention des ingénieurs métallurgistes les phénomènes qui conditionnent les propriétés d'usage d'un métal pour faire comprendre les différents aspects du travail métallurgique et donner des pistes pour modifier ces propriétés en fonction du cahier des charges souhait. Sont d'abord décrites les propriétés intéressantes pour l'emploi du métal et sont expliquées succinctement leur provenance. Puis sont présentés les différents métaux et leur constitution, assemblage de grains, assemblage de phases, arrangement des atomes. L'évolution naturelle plus ou moins rapide du métal vers un état d'équilibre en fonction des conditions extérieures, essentiellement la température, est alors analysée. Sont notamment précisés les défauts qui influent sur cette évolution et les mécanismes qui l'accompagnent: mouvement des atomes, diffusion, mouvement des dislocations, mouvement des précipités, coalescence, transformations de phase. Enfin, en application pratique, des différentes notions sont présentées et, compte tenu du grand nombre de paramètres et de la variété des métaux, des pistes de réflexion sont présentées pour guider le métallurgiste dans son action de contrôle et d'évolution du métal.

**Bulletin signalétique 161: Structure de la matière II - Cristallographie** ,1970 **Bulletin signalétique** ,1957 **Optique et structure de la matière ; solutionnaire** André Arès, Jules Marcoux, 1974 **La physique théorique nouvelle** Julien Pacotte, 1921

Proceedings of the Fourth International Congress for Logic, Methodology and Philosophy of Science, Bucharest, 1971 Lev D. Beklemishev, 2000-04-01 Proceedings of the Fourth International Congress for Logic Methodology and Philosophy of Science Bucharest 1971 **Revue d'optique théorique et instrumentale** ,1923 **Bulletin analytique** ,1960 **La constitution morphologique de la matière vivante d'après l'enseignement de J. Kunstler** Joseph Kunstler, 1917

**Canadiana** ,1989 **BAR International Series** ,1978 **Précis d'optique public d'après l'ouvrage de Paul Drude: Optique géométrique. Optique ondulatoire. 1911. x. 315. [1] p** Paul Drude, 1911 **Annales de Chimie--science Des Matériaux** ,1998 **Les nouveaux horizons de la science: La matière vivante; sa chimie, sa morphologie** Hyacinthe Guilleminot, 1914 *Bulletin signalétique* Centre national de la recherche scientifique (France). Centre de documentation, 1967

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