

the trend towards digital X-ray imaging in dentistry

Enhancement layers on CCDs and CMOS, thallium-doped caesium iodide (CsI:TI), phosphor coatings and other promising materials allow convenient digital data capture that will become the future of dental imaging.

Market Summary

Film is the traditional method of X-ray imaging in dentistry with which we are all familiar. Film has excellent imaging properties but requires a high X-ray dose and chemical processing in a light-controlled environment with environmentally toxic chemicals.

The use of computers in dental surgeries for patient records allows dentists the additional advantage of being able to capture and store digital images. This greatly improves patient record administration, improving efficiency of data storage and retrieval and information transfer and allowing improved long term care plans and 'one visit' patient strategies.

Another key feature of this technology is the enhancement of patient confidence and understanding by enabling the dental practitioner to offer pictorial patient treatment plans via the digital system's VDU.

Thus digital capture methods based on CCDs or storage phosphor are more sensitive, require lower X-ray doses, eliminate chemical processing and facilitate immediate image display or retrieval from patient records.

Applied Scintillation Technologies with extensive experience in custom phosphor and scintillator development and manufacture, are well placed to respond to the challenges set by systems manufacturers for high performance scintillation screens for integrating into intro-oral and panoramic camera systems.

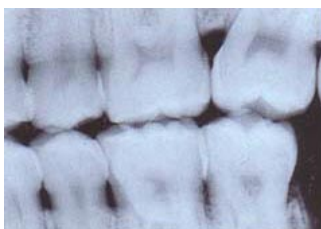


Image courtesy of Medivance Ltd

Solutions from Applied Scintillation Technologies

Applied Scintillation Technologies has a range of products which it can offer, customised to meet the individual requirements of the systems integrator:

- discrete X-ray screens for optical coupling either to fibre optic face plate or direct to the imaging device
- fibre optic coatings for integration into CCD coupled technology
- high quality X-ray sensitive layers with variable absorption characteristics
- adhesive X-ray screens for medium resolution, low cost CMOS/CCD imaging
- modification of imaging properties by use of integral reflector and absorber configurations

Each configuration offers particular features and benefits important for high quality dental imaging.

The most important dental imaging parameters are a good, clean image with desirable resolution - the modulation transfer function (MTF) being 5-8 line pairs/mm at mid-range, 12lp/mm at high resolution and >12lp/mm at ultra-fine resolution. As far as image quality is concerned, photographic quality is usually sufficient, the advantages of digital imaging coming from selectively enhancing parameters. In addition, features such as high contrast and low background variation (graininess) are important.

A feature of dental radiography is the distinction between imaging of dental structures (hard tissue imaging) and observation of variation in low-density material (soft tissue imaging).

Also important is the increased linearity of response gained by using scintillators and digital imaging over conventional film and reduced dose from efficiency gains.

Applied Scintillation Technologies offer a range of defined product options which offer superior detection of dental caries and imaging of dental features for the benefit of dentists and their patients.

AST's Scintillator Material Options

- ◆ thallium-doped caesium iodide
CsI:Tl has the ability to be grown in a columnar structure allowing greater control over the thickness of the scintillator layer while minimising the compromises between thickness, efficiency and resolution which are feature of scintillator materials.
X-ray absorption characteristics are such that soft tissue imaging is enhanced.
With high efficiency and minimal scattering providing excellent resolution, CsI:Tl deposited on a fibre optic face plate offers the highest performance scintillator for dental imaging.

- ◆ terbium-doped gadolinium oxysulphide
 $Gd_2O_2S:Tb$ – a rugged and relatively low cost option with high efficiency and X-ray absorption – major absorption edge at 50KV. This makes it particularly suited to high contrast, hard tissue imaging. The material is available in a range of particle sizes and is flexible in its usage.

- ◆ terbium-doped yttrium oxysulphide
 $Y_2O_2S:Tb$ – with an absorption edge at lower energy than other materials (19KV), this material can provide enhanced soft tissue performance despite its lower density

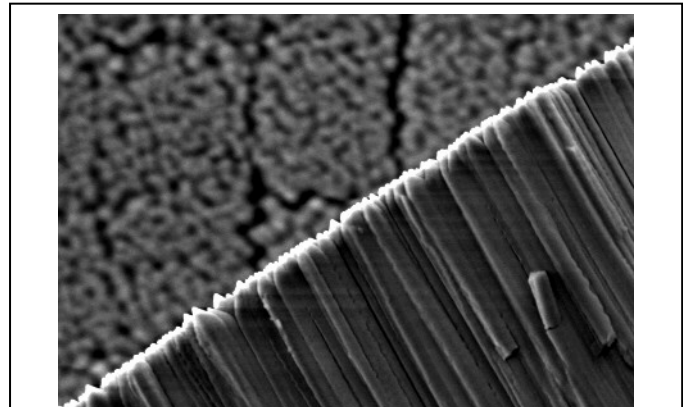
- ◆ red emitting phosphors
The previous materials provide green emission at approx. 545nm. AST can provide both the terbium doped phosphors above with Europium (Eu) doping which will provide emission in the red which may more closely match the sensitivity spectrum of the CCDs being used

- ◆ rapid response phosphors
In certain circumstances – particularly in extra-oral/panoramic imaging – it may be beneficial to have rapid response from the scintillator. AST can provide both the phosphors noted previously with Praseodymium (Pr) doping which provides a response time in the 5 – 10us region rather than the 1 – 3ms region more commonly seen.

- ◆ varied over coatings
AST offers in-house protective coatings for scintillators but can also offer alternative reflective and absorber layers to maximise system resolution and efficiency.

Applied Scintillation Technologies has the knowledge and expertise based on years of experience to partner you in the development of custom products for CCD, CMOS or FOPF technologies. Resolution, sensitivity, speed & colour of response are a few of the parameters that can be influenced in the production of a customised product that more closely relates to your customer need.

- ◆ A customised product is often a more cost effective solution
- ◆ Formulations can be developed to meet your specific requirements
- ◆ Exceed your initial expectations through partnership development
- ◆ An ISO9002 company – quality assurance is guaranteed through every delivery
- ◆ Product differentiation can provide unique product positioning versus competitors
- ◆ Enjoy continued product development and technical support through partnership



CsI columnar structure on Std Xio F1 scintillator

AST's Scintillator Formats

- ◆ standard screens – MedeX Superfine, MedeX Superfine Plus
AST offers a range of standard phosphor based X-ray screens for bonding to fibre optic face plates. Screens can be customised in coating weight and particle size using the phosphors previously outlined to maximise system performance in X-ray absorption, efficiency and resolution.
These screens can be supplied in large area sheet format, pre-coated with adhesive if required, for the customer to cut to size. Alternatively AST can provide pre-cut scintillators and also offers a service for bonding the screen to substrates.

- ◆ depositions on fibre optic face plates (FOFPs) – FOP Intra-oral, FOP Panoramic, Xio F1
AST also directly deposits phosphors on FOFPs. These also provide the preferred vehicle for CsI:Tl depositions with AST having the capability to register the CsI:Tl columns with the core of the FOFP for maximum resolution (Xio F1).
AST routinely deposits on 6um FOFPs from Schott Fiber Optics Inc but can also provide system enhancement by coating on customer specified substrates for those innovative system manufacturers who require a unique and differentiated product for today's high performance medical imaging market.

APPLIED SCINTILLATION TECHNOLOGIES LTD
8 ROYDONBURY INDUSTRIAL ESTATE
HORSECROFT ROAD
HARLOW CM19 5BZ UNITED KINGDOM
TEL +44 [0] 1279 641234 FAX +44 [0] 1279 413679
e-mail sales@appscintech.com



www.appscintech.com