Understanding single-crystal x-ray crystallography pdf

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The voltage difference between the cathode and anode is extremely high, so the electrons fly through the tube with a great deal of force. When a speeding electron collides with a tungsten atom, it knocks loose an electron in one of the atom's lower orbitals. An electron in a higher orbital immediately falls to the lower energy level, releasing its extra energy in the form of a photon. It's a big drop, so the photon has a high energy level -- it is an X-ray photon. Free electrons can also generate photons without hitting an atom. An atom's nucleus may attract a speeding electron just enough to alter its course. Like a comet whipping around the sun, the electron slows down and changes direction as it speeds past the atom. This "braking" action causes the electron to emit excess energy in the form of an X-ray photon. The high-impact collisions involved in X-ray production generate a lot of heat. A motor rotates the anode to keep it from melting (the electron beam isn't always focused on the same area). A cool oil bath surrounding the envelope also absorbs heat. The entire mechanism is surrounded by a thick lead shield. This keeps the X-rays from escaping in all directions. A small window in the shield lets some of the X-ray photons escape in a narrow beam. The beam passes through a series of filters on its way to the patient. A camera on the other side of the patient records the pattern of X-ray light that passes all the way through the patient's body. The X-ray camera uses the same film technology as an ordinary camera, but X-ray light sets off the chemical reaction instead of visible light. (See How Photographic Film Works to learn about this process.) Generally, doctors keep the film image as a negative. That is, the areas that are exposed to more light appear darker and the areas that are exposed to less light appear lighter. Hard material, such as bone, appears white, and softer material appears black or gray. Doctors can bring different materials into focus by varying the intensity of the X-ray beam. Contrast Media In a normal X-ray, most soft tissue doesn't show up clearly. To focus in on organs, or to examine the blood vessels that make up the circulatory system, doctors must introduce contrast media into the body, which are are liquids that absorb X-rays more effectively than the surrounding tissue. To bring organs in the digestive and endocrine systems into focus, a patient will swallow a contrast media mixture, typically a barium compound. If the doctors want to examine blood vessels or other elements in the circulatory system, they will inject contrast media into the patient's bloodstream. Contrast media are often used in conjunction with a fluoroscope. In fluoroscopy, the X-rays pass through the body onto a fluorescent screen, creating a moving X-ray image. Doctors may use fluoroscopy to trace the passage of contrast media through the body. Doctors can also record the moving X-ray images on film or video. Metal appears as a bright area on an X-ray, blocking visibility of underlying structures. The reason you're asked to remove metal is to give the radiologist an unobstructed view of the area of interest. Basically, you remove metal because it blocks anatomy. If you have a metal implant, obviously you can't remove it for an X-ray. If the technician is aware of it, he may position you differently to get the best imaging results or take X-rays from multiple angles. The reason metal appears bright on the X-ray image is that it is extremely dense, so X-radiation does not penetrate it as well as it does soft tissues. This is also why bones appear bright on an X-ray. Bones are denser than blood, cartilage, or soft organs. Unless the metal item is directly in the path between the X-ray collimator and the image receptor, there's no issue with having metal objects in the same room as an X-ray machine. On the other hand, metal objects are not permitted in a room housing MRI equipment because the objects will be drawn toward the powerful magnets when the machine is turned on. Then, the problem isn't with the image; it's with the items, which could become hazardous projectiles, possibly injuring people or damaging equipment. Click here or from the home page, click on Plan > Personal Finance > Instant X-Ray Use Instant X-ray to Evaluate your asset allocation and sector weightings, uncover concentrated positions, and view the stock holdings behind your mutual funds. See a sample X-Ray report here. Enter the tickers you want to evaluate and click Show Instant X-ray. Transparency is how we protect the integrity of our work and keep empowering investors to achieve their goals and dreams. 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