

Re: Meanwhile, back in the lab...

Source: <http://sci.tech-archive.net/Archive/sci.physics/2005-05/msg02597.html>

- *From:* glhansen@xxxxxxxxxxxxxxxxxxxxxxxx (Gregory L. Hansen)
 - *Date:* Thu, 19 May 2005 14:21:55 +0000 (UTC)
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In article <1116467397.252775.237190@xx>, Sbharris[at]ix.netcom.com <sbharris@xxxxxxxxxxxxxxxx> wrote:
>Greg, was my last question to you too difficult to answer off hand?
>
>The question I have is this: what happens when you run "few mev"
>protons or neutrons through single crystals of (say) graphite at small
>angles in comparison to the plane defined by the sheets of C atoms.
>With the beam passing orthogonally (the 001 direction) through the
>common plane defined by the stacked sheets, you'd get one attenuation
>coefficient. And presumably at right angles to that, so the particles
>were passing straight down the "alleys" between the sheets (the 112
>direction) you'd get another coefficient. In both cases these would
>related to the average density of the crystal in the direction of
>interest. But now, what happens when you tilt the thing just a little
>in either direction from 112??? Do the particles now go off greatly to
>one side or the other? And is the effective shielding coefficient per
>mass a LOT greater in the direction where the particles DON'T go, than
>you could get with other materials?
>

Sorry, I didn't see it before. I search for "hansen", so that's a sure way to catch my attention. Otherwise, whether I read a message or not is more or less by chance.

But the angle of incidence still equals the angle of reflection, and that angle is relative to a scattering plane. The Bragg peaks in an ideal crystal are delta functions, any real crystal has peaks of a certain width, the Darwin width(?), that depends on its size and quality. And the intensity depends on the number of atoms in that plane, so you get strong scattering from planes like 100 or 111, but not so strong scattering from e.g. 800.

So to sortakinda answer your question, they'll reflect from any plane that meets the Bragg condition, in whatever direction that happens to be, and with the intensity being very small for most possible planes. And if there's not a plane meeting the Bragg condition, they won't reflect. I don't know what's near 112.

Re: Meanwhile, back in the lab...

The effective shielding versus crystal angle depends on energy. It's really only a highly monochromatic AND collimated beam that allows you to say something definite about which reflections you pick up for some small change in angle. If the incident beam is "white" then basically all reflections will be present because every Bragg plane will see some neutrons with the magic perpendicular component of momentum— reflection from a plane isn't really determined by energy, but the the component of momentum perpendicular to the plane, so a higher wavelength beam incident at a shallower angle can still reflect, or a lower wavelength beam at a steeper angle.

That's about as much as I can say off hand.

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"The result of this experiment was inconclusive, so we had to use statistics." (Overheard at international physics conference)

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• *Follow-Ups:*

- ◆ *Re: Meanwhile, back in the lab...*
◇ *From:* Sbharris[at]ix.netcom.com
- ◆ *Re: Meanwhile, back in the lab...*
◇ *From:* mmeron

• *References:*

- ◆ *Meanwhile, back in the lab...*
◇ *From:* Gregory L. Hansen
- ◆ *Re: Meanwhile, back in the lab...*
◇ *From:* Sbharris[at]ix.netcom.com

- Prev by Date: *Re: Charge*
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