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Exploring Zeolites as Radon Adsorbents in Noble Gas Experiments

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Dark matter constitutes most of the universe's mass, yet its interactions remain elusive due to its weak coupling to the visible spectrum, necessitating innovative detection methods. Weakly interacting massive particles (WIMPS), are a promising dark matter candidate, and are theorized to interact with standard model particles via nuclear recoiling. At the forefront of investigating this interaction are liquid noble gas detectors, which are deep underground vessels filled with liquid argon (LAr) or xenon (LXe), surrounded by photosensors. Future large-scale detectors, are investigating the use of xenon doped argon, to increase light yield from recoils. However, radon decay chains pose a challenge, as radon bonds with noble gases via van der Waals forces, generating false signals that obscure rare event identification. For gasses like argon, this is approached by using activated charcoal as a radon absorbent, but for xenon, which has a comparable size to radon, its own molecules risk adsorption as well. To remove radon from xenon, large, expensive, cryogenic distillation facilities have been used, which have been found to be quite effective. However, new adsorption mediums have recently been introduced in the form of zeolites, which have been shown to be more effective adsorbents than activated charcoal for a variety of carrier gasses and temperatures. This talk will go into exploring the use of silver-zeolites as a cheap and efficient adsorbent for radon in carrier noble gasses.

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