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The Radiation Shielding Specimen Made from Natural Rubber Combined with Bismuth Powder

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Introduction: Nowadays, the ionizing radiation is widely used in a numerous institution especially for medical section. However, the used of ionizing radiation can cause the radiation hazard. Commonly, the occupational is follow the as low as reasonably achievable (ALARA) principle which consist of short time, long distance and optimal shielding. Occasionally, technician have to operate with the short distance and take a long time. Therefore, shielding is the most important for radiation protection. Lead shielding was proved as the good radiation protection and prominent material. In the another hand, lead is also a burden for worker due to overweight and toxicity.

Purpose: To construct the lead-free radiation shielding made from natural rubber combined with bismuth powder.

Methods: The natural rubber 60 ml and silicon rubber 60 ml were stirred. Then bismuth powder 10 g was mixed together with natural and silicon rubber. After that put the mixture in the mold size 10x10x1 cm (100 cm^3/100 ml). Repeated these rubber components with bismuth powder 15 g and filled in the 2^{nd} mold. Setup high x-ray exposure technique (120 kvP, 10 mAs) and measured and recorded the absorbed dose by GAMMEX model 330. Used the 1^{st} mold shielded over the GAMMEX detector and recorded the exist value of absorbed dose. Repeated the measurement by used the second mold.

Results: This study found the absorbed dose level was decreased when the bismuth powder were increased. The dose comparison between without shielding and the shielding specimen of natural/silicon rubber mixed with 10 g and 15 g bismuth powder showed the absorbed dose reducing about 56.77% and 62.26%, respectively.

Discussion & Conclusion: Our results indicate that the bismuth powder combined with natural and silicon rubber can be used to decreasing the radiation as lead shielding component. Moreover, this specimen also provides more user-friendly than lead shielding including the lighter-weight and be flexible.

Keywords: Radiation shielding / Natural rubber / Bismuth powder

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