

## Prospects of Using Radioactive Cement in the Treatment of Bone Cancer

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**Introduction:** Bone cancer is a serious and often challenging condition that can severely affect the skeletal structure and the overall health of patients. Despite advances in medical treatments, the management of bone cancer remains complex, and current treatment options like surgery, chemotherapy, and radiotherapy often have limitations in terms of targeting tumors and minimizing damage to healthy tissues. Recently, the use of radioactive cement has emerged as a novel approach in the treatment of bone cancer. Radioactive cement combines the benefits of localized radiotherapy and mechanical stabilization, offering potential advantages for improving treatment outcomes.

Radioactive cement is designed to deliver radiation directly to the tumor site while simultaneously providing structural support to the affected bone. This combination of therapeutic and supportive functions represents a significant advancement in the field of bone cancer treatment. This thesis will examine the prospects of using radioactive cement in treating bone cancer, evaluating its potential benefits, challenges, and clinical applications, as well as exploring its role in future treatment regimens.

**Keywords:** polymethyl methacrylate, cement, kaolin, vertebroplasty, kyphoplasty, radioisotopes, cesium-137, strontium-90.

**Research Objectives:** The primary goal of this thesis is to explore the feasibility and future prospects of using radioactive cement in the treatment of bone cancer. The objectives include:

Analyzing the properties of radioactive cement and how they contribute to its potential in treating bone cancer.

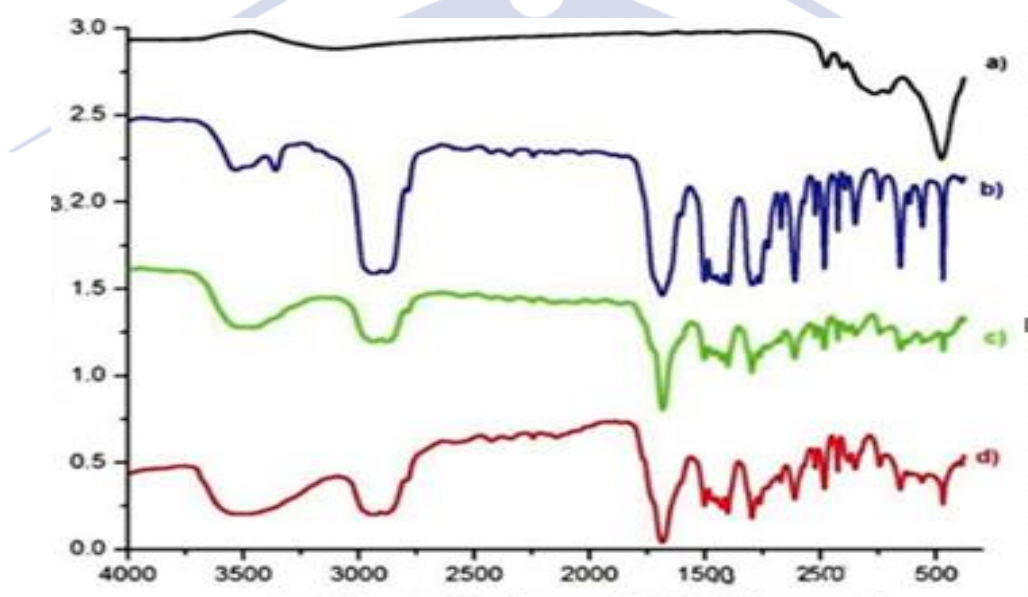
Investigating the clinical applications and outcomes of using radioactive cement in real-world settings.



Evaluating the advantages and potential drawbacks of this method compared to conventional treatments.

Considering the future directions and research needed to optimize and expand the use of radioactive cement in clinical practice.

**IR spectroscopy.** The obtained composite material was analyzed using the OVIRS brand IR spectrometer at the Physics Research Methods Laboratory of the Chemistry Faculty of Termez State University. The chemical bonds between the polymer matrix and components were studied. The IR spectra of kaolin filler, the polymer matrix (PMMA), and radioactive cesium-137 are shown in **Figure 1**.



**Figure 1. IR Spectral Results of the RF-24 Radioactive Cement Composite.**

The IR spectrum of the kaolin filler shows peaks up to approximately  $500\text{ cm}^{-1}$ , which may correspond to the Ti-O-Ti stretching vibration mode of the piezoceramic structure. In the case of kaolin powder in dispersion in the respective solvent, we can also observe the characteristic absorption band of the solvent at  $2945\text{ cm}^{-1}$ . The vibration characteristics of the CH group are observed at  $2882\text{ cm}^{-1}$  (asymmetric stretching), the C=O bond is observed at  $1686\text{ cm}^{-1}$  (asymmetric stretching vibration), and the CN bond is observed at  $1305\text{ cm}^{-1}$  (non-symmetric stretching vibration). This fully explains the composition of the obtained composite.



**Conclusion:** The use of radioactive cement in the treatment of bone cancer presents significant promise for improving patient outcomes by providing a targeted, localized radiation therapy combined with mechanical stabilization. This dual functionality makes it an attractive alternative or complement to traditional treatment methods. However, further research and clinical trials are essential to fully understand its efficacy, safety, and long-term benefits. With continued development, radioactive cement may play a critical role in the future of bone cancer treatment, offering new hope for patients and enhancing the effectiveness of current therapeutic strategies.



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