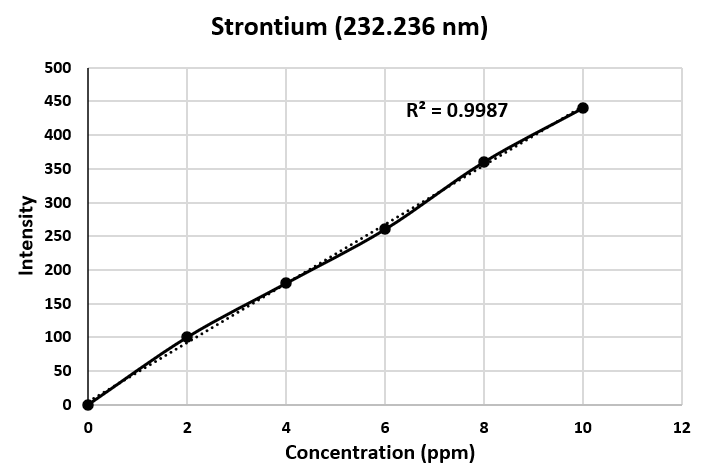
**Waste-Derived Activated Carbons for Effective Adsorptive Removal of Strontium, Barium, and Binary Contaminants: A Response Surface Methodology Study**

Shifa Zuhara1 and Gordon McKay1

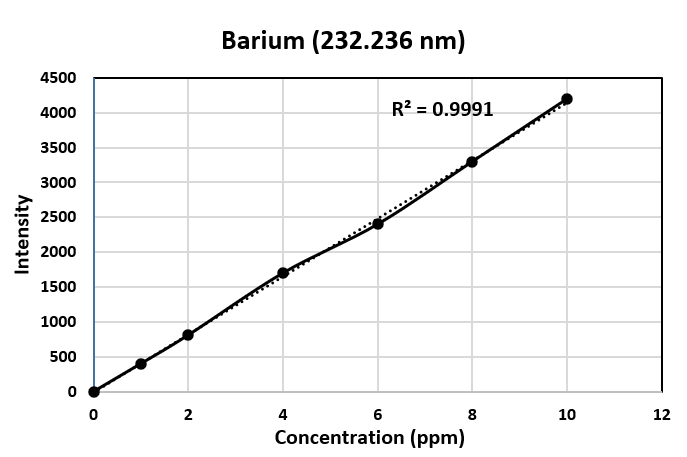
1 Division of Sustainable Development, College of Science and Engineering, Hamad Bin Khalifa University, Education City,

Qatar Foundation, Doha, Qatar.

\*Author for Correspondence: Shifa Zuhara, Email: szuhara@hbku.edu.qa



(A)



(B)

*Figure S1: Calibration curves- Strontium, barium*

*Table S1: Literature comparison of strontium, barium adsorption*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Conditions** | **Sr** | **Ba** | | **Bi-Sr** | **Bi-Ba** | |
| **Adsorption capacity (mg/g)** | | | | | |
| KBS | pH: 6.00 Temperature: 40.0℃ Dose: 0.300g | 81.9 | 90.3 | | 75.2 | 82.7 | |
| KCB | 86.2 | 92.9 | | 77.7 | 85.6 | |
| KM | 88.1 | 93.5 | | 77.7 | 86.1 | |
| **Reference** | **Sample** | **Strontium (mg/g)** | | **Barium (mg/g)** | | |
| [1] | Salvadora persica (Miswak) | 41.4 | | 34.9 | | |
| [2] | Rice straw | 73.9 | | 59.8 | | |
| [3] | Manganese dioxide-loaded mesoporous SBA-15 silica composites | 75.1 | | - | | |
| [4] | Expanded perlite | 1.14 | | 2.48 | | |
| [5] | Coffee biochar (pristine)  Coffee biochar (Activated) | 4.99 6.62 | | 6.94  11.1 | | |

**References**

[1] S. S. M. Hassan, A. H. Kamel, M. A. Youssef, A. H. A. Aboterika, and N. S. Awwad, “Removal of barium and strontium from wastewater and radioactive wastes using a green bioadsorbent, salvadora persica (Miswak),” *Desalin. Water Treat.*, vol. 192, pp. 306–314, 2020, doi: 10.5004/dwt.2020.25774.

[2] S. A. Younis, R. A. El-Salamony, Y. F. Tsang, and K. H. Kim, “Use of rice straw-based biochar for batch sorption of barium/strontium from saline water: Protection against scale formation in petroleum/desalination industries,” *J. Clean. Prod.*, vol. 250, p. 119442, 2020, doi: 10.1016/j.jclepro.2019.119442.

[3] H. Dan *et al.*, “Manganese dioxide-loaded mesoporous SBA-15 silica composites for effective removal of strontium from aqueous solution,” *Environ. Res.*, vol. 191, no. February, p. 110040, 2020, doi: 10.1016/j.envres.2020.110040.

[4] M. Torab-Mostaedi, A. Ghaemi, H. Ghassabzadeh, and M. Ghannadi-Maragheh, “Removal of strontium and barium from aqueous solutions by adsorption onto expanded perlite,” *Can. J. Chem. Eng.*, vol. 89, no. 5, pp. 1247–1254, 2011, doi: 10.1002/cjce.20486.

[5] J. Shin *et al.*, “Changes in adsorption mechanisms of radioactive barium, cobalt, and strontium ions using spent coffee waste biochars via alkaline chemical activation: Enrichment effects of O-containing functional groups,” *Environ. Res.*, vol. 199, no. May, p. 111346, 2021, doi: 10.1016/j.envres.2021.111346.