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HRE31-P01 Room:Poster Time:May 2 16:15-17:30

Use of sodium polytungstate as an X-ray contrast agent to reduce beam hardening in hydrogeological experiments

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Iodine is conventionally used as a contrast agent in hydrogeological experiments using polychromatic X-ray computed tomography (CT) to monitor multi-phase Darcy flow in porous geological media. Undesirable beam hardening artifacts, however, make the quantitative analysis of the obtained CT images difficult. CT imaging of porous sand packs saturated with iodine and tungsten-bearing aqueous solutions, respectively, was performed using a medical CT scanner. The result (Fig. 1) shows that sodium polytungstate ($Na_6H_2W_{12}O_{40}$) significantly reduced the beam hardening compared with potassium iodide (KI). This result is due to the location of the K absorption edge of tungsten, which is nearer to the peak of the polychromatic X-ray source spectrum than that of iodine. As sodium polytungstate is chemically stable and less toxic than other heavy element bearing compounds, we recommend it as a promising contrast agent for hydrogeological CT experiments.

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References:
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Keywords: beam hardening, contrast agent, Darcy flow, porous media, multi-phase flow, relative permeability

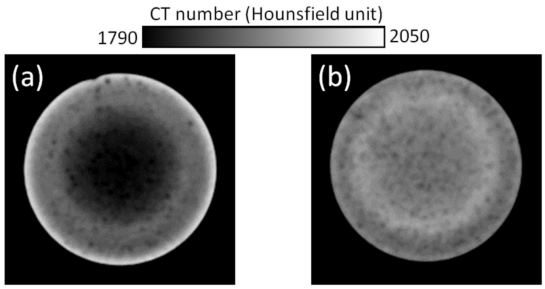

Fig. 1. Two-dimensional CT slices of homogeneous sand pack samples (diameter, 56 mm) saturated with a heavy-element-bearing fluid. Each image dimension is 210^2 voxels = 66^2 mm^2. The image for KI 9.16 wt.% (a) shows marked beam hardening compared with $Na_6H_2W_{12}O_{40}$ 8.80 wt.% (b). Numerous dark spots are small bubbles.