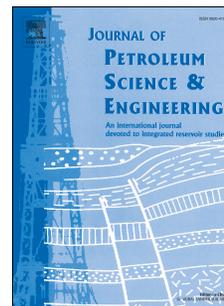


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A novel self-healing spacer fluid for sustained casing pressure mitigation

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# 1 A novel self-healing spacer fluid for sustained casing pressure 2 mitigation

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8

## 9 Abstract

10 *Sustained casing pressure (SCP) is one of the most common and costly problems in the oil and gas industry, which*  
11 *results in various unfavorable effects in the economy and catastrophic consequences. The development of*  
12 *micro-annulus and micro-cracks within the cement sheath causes the need to develop a unique self-healing*  
13 *spacer fluid to enhance the integrity of cement sheath. This study aims to investigate a novel self-healing spacer*  
14 *fluid that provides a long-term zonal isolation to mitigate SCP problems during well cementing or production*  
15 *operations. Micro-annulus or micro-crack simulation experiments were conducted on artificial cement sheath*  
16 *samples under various confining pressures to investigate the self-healing capability of the novel self-healing*  
17 *spacer fluid. Post-evaluation methods, such as self-healing test and computed tomography scanner, as well as*  
18 *scanning electron microscopy, were used to investigate the effect of the self-healing spacer fluid on the properties*  
19 *of the original cement slurry and repair effectiveness. The self-healing capability of the novel self-healing spacer*  
20 *fluid was assessed based on the conducted experiments and post-evaluation analyses. The effect of the*  
21 *self-healing spacer fluid on the cement slurry properties and casing corrosion was also analyzed. Experiment*  
22 *results indicated that the novel self-healing spacer fluid could penetrate into the micro-cracks or micro-annulus*  
23 *within the cement sheath to activate the hydration reaction of the non-hydrated cement, thereby producing a*

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