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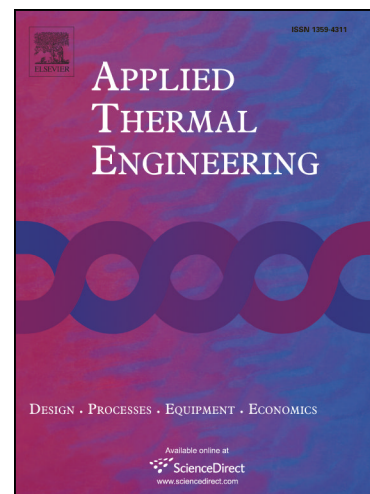
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**Pressure effect on flame spread over polyethylene-insulated copper core wire**Yanli Zhao <sup>a</sup>, Jian Chen <sup>a</sup>, Xiao Chen <sup>a,\*</sup>, Shouxiang Lu <sup>a,\*</sup>

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**ABSTRACT**

The effect of pressure on the mechanism of flame spread over the polyethylene-insulated wire with copper core has been studied under the experimental condition of 21 vol% O<sub>2</sub> and balanced N<sub>2</sub> with total pressure varying from sub-atmospheric pressure (60 kPa) to elevated pressure (500 kPa). Flame shape, melt dripping characteristic of polyethylene insulation and flame spread rate have been investigated. The results show that flame behavior was affected obviously by ambient pressure. The frequency of melt dripping diminishes as pressure increases and no melt dripping occurs when pressure reaches 200 kPa. With increasing ambient pressure, the flame height firstly increased and then decreased with a maximum value at approximately 200 kPa, whereas the flame width decreases monotonously. The flame spread rate increased with the enlarged pressure. Two heat transfer paths, heat feedback from flame and heat conduction through wire core, were found to account for the variation of flame spread rate. A heat balance analysis considering these two heat transfer mechanisms in the flame front zone is proposed to establish the flame spread model. Moreover, heat feedback from flame which consists of the convective and radiant heat transfer in the flame front zone was proved to dominate the flame spread mechanism for fine copper wire.

**Keywords:** flame spread; electric wire; polyethylene insulation; pressure effects; heat transfer

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