By referring to its standard melting point, the polypropylene melting temperature 173°C and melt flow index was at 10.5g/10 min at 230°C. The temperature setup for the composites was 190°C, allowing it to equalize for 30 minutes. The drum velocity was kept at 12 rpm. After that, polypropylene was then gently poured, allowing 5 minutes to thaw. After polypropylene was fully placed according to its weight composition, kenaf was randomly mixed by milligram, which completion of duration is 20 minutes. Rice husk silica was then added to the mixer. Finally, the composite mixture is removed quickly to prevent overheating. After the mixing process, crusher machine was used to crush the material into mild pieces.

2.3 Injection Molding

The composite mixture of the material has been injected with a temperature of 190°C by injection molding machine. The pelletizing raw material and colorant were decreased to a hot liquid by the molding machine. This melting was forced under high pressure into a cooled mold. The mold was unclamped after the specimen was fabricated and a sample was automatically ejected.

2.4 Tensile Test

Tensile test specimen was prepared follows to the standard of ISO 527. The universal testing machine (UTM) with 10N capacity of load cell was used to conduct the tensile test under strain rates of 5 mm/min, 25mm/min and 50mm/min to obtain the tensile properties of composites. Fig. 1 shows tensile test specimen geometry which follows with ISO 527 standards.

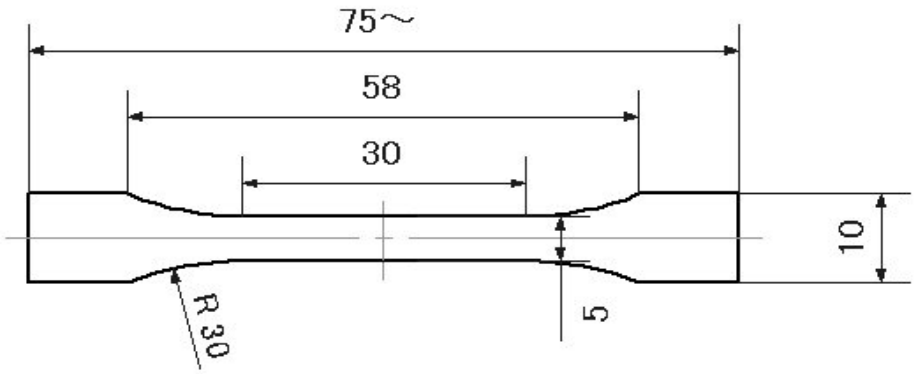

Fig. 1 – Geometry of tensile test specimen

3. Results and Discussion

Fig 2 shows the effect of strain rates on tensile properties of composite materials between kenaf fiber, rice husk silica (89.09% and 94.05%), and polypropylene composites. The yield stress (MPa), ultimate tensile strength (MPa) and elongation (%) of composites sample were determined.

Refer to the results of 1st grade from Fig 2 – (a), its shows that the yield stress increase and increasing strength rate of composites materials. It's also shown similar results to the ultimate tensile strength, Fig 2 – (c), except ultimate tensile strength at 60% polypropylene+ 30% kenaf fiber+10% rice husk silica composite material. The higher percentage of kenaf fiber is sufficient to provide the composite with good mechanical properties [9,18].

2nd grade of rice husk silica uses as composite material with kenaf fiber reinforced polypropylene shows that 60% polypropylene+20% kenaf fiber+20% rice husk silica, has good behavior at yield stress and ultimate tensile strength, Fig 2 – (b) and (d). The yield stress increase and increasing strength rate. The tensile strength and its Young's modulus exhibited an increasing trend for 20 wt% of kenaf fiber and rice husk content [19-21]. This proves that the addition of kenaf fiber and rice husk silica as reinforcement increase the tensile strength of composites. The elongation decreases as its ductile material. The range of its elongation is between 7.5 to 14.5%.

Overall, the results shows that 2nd grade of rice husk ash has better behavior material compared to 1st grade of rice husk silica. The higher silica content, the good the composite materials obtained.

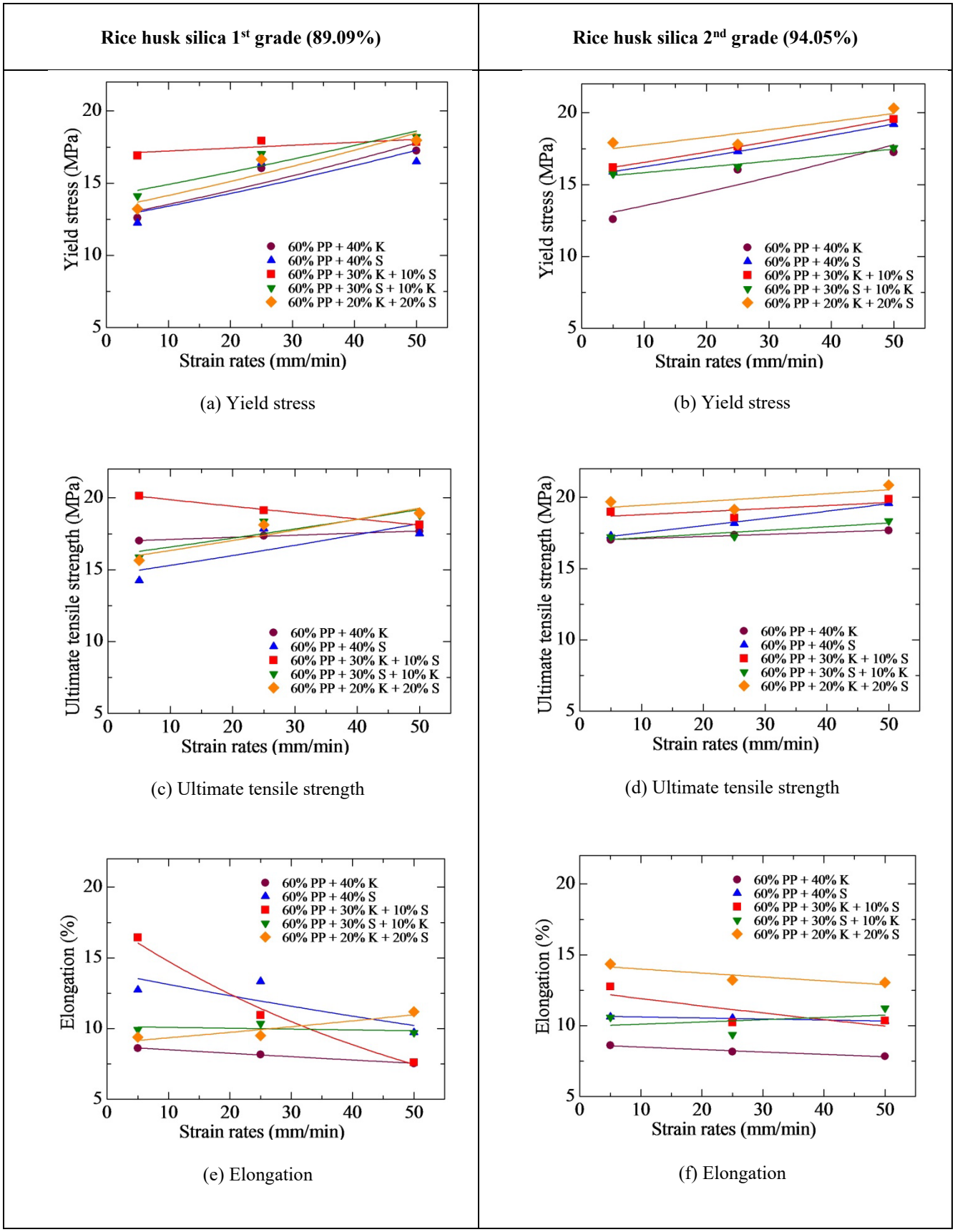

Fig. 2 –Tensile properties for composite kenaf fiber and rice husk silica reinforced polypropylene of (a) Yield stress at 1st grade; (b) Yield stress at 2nd grade; (c) Ultimate tensile strength at 1st grade; (d) Ultimate tensile strength at 2nd grade; (e) Elongation at 1st grade; (f) Elongation at 2nd grade.

4. Summary

The behaviour tensile under elevated strain rates of kenaf fiber and rice husk silica reinforced polypropylene composites at different grades of rice husk silica (89.09% and 94.05%) content were investigated. The tensile tests that carried out found that the best result of yield stress, ultimate tensile strength and elongation is in composition of 20 wt.% kenaf fiber and 20 wt.% rice husk silica with 20.31MPa, 20.86MPa and 13.05% compared to others composites percentage. High silica content which is 2nd grade shows the best result compared to 1st grade rice husk ash. This also proves that silica content of rice husk ash improves behaviour with increases the yield and ultimate tensile strength of composites.

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