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Title: Method for improving gas single-phase heat transfer using metal sintered high porous structures.

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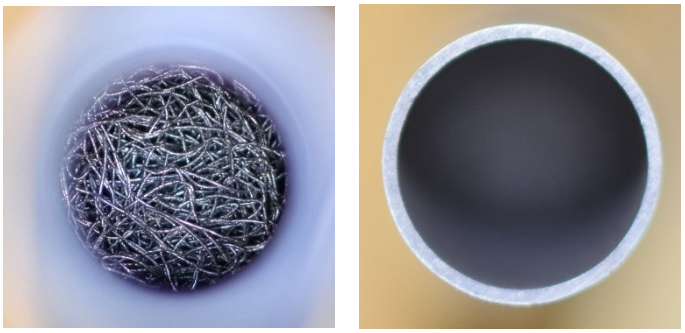
Extended Abstract: In this study, experiments were performed to enhance the gas-side single phase heat transfer using metal sintered high porous structures. inside an aluminum tube with the diameter 6, 12 and 18mm, respectively. The characteristics of heat transfer and pressure drop were clarified by changing the filling length and porosity, and compering the normal tube. The greatest feature of this porous material is that it is made of the same material as the aluminum tube and is sintered, so that the contact thermal resistance can be hugely reduced. The effect on the heat transfer of the porous tube increased by almost 20 - 40 times as compared with the normal tube. However, the pressure drop of the porous tubes are higher than the same diameter tubes. Although the pressure drop is increased, substantial improvement of air-side heat transfer using the metal sintered high porosity porous inside an aluminum tube had been found useful in various fields by this experiment.

Figure 1(a) shows the metal fiber sintered tube, Fig.(b) is normal tube. These tubes length are 450 mm , respectively. The porosity is 80 %, the tube is installed in the experimental apparatus showed in Fig. 2. The heat exchange length is 150 mm using double tube flowing saturation refrigerant R600a (isobutane), the saturation temperature is 1 ºC.



(a) Metal fiber sintered tube (b) Normal tube

Figure 1 Test Tubes

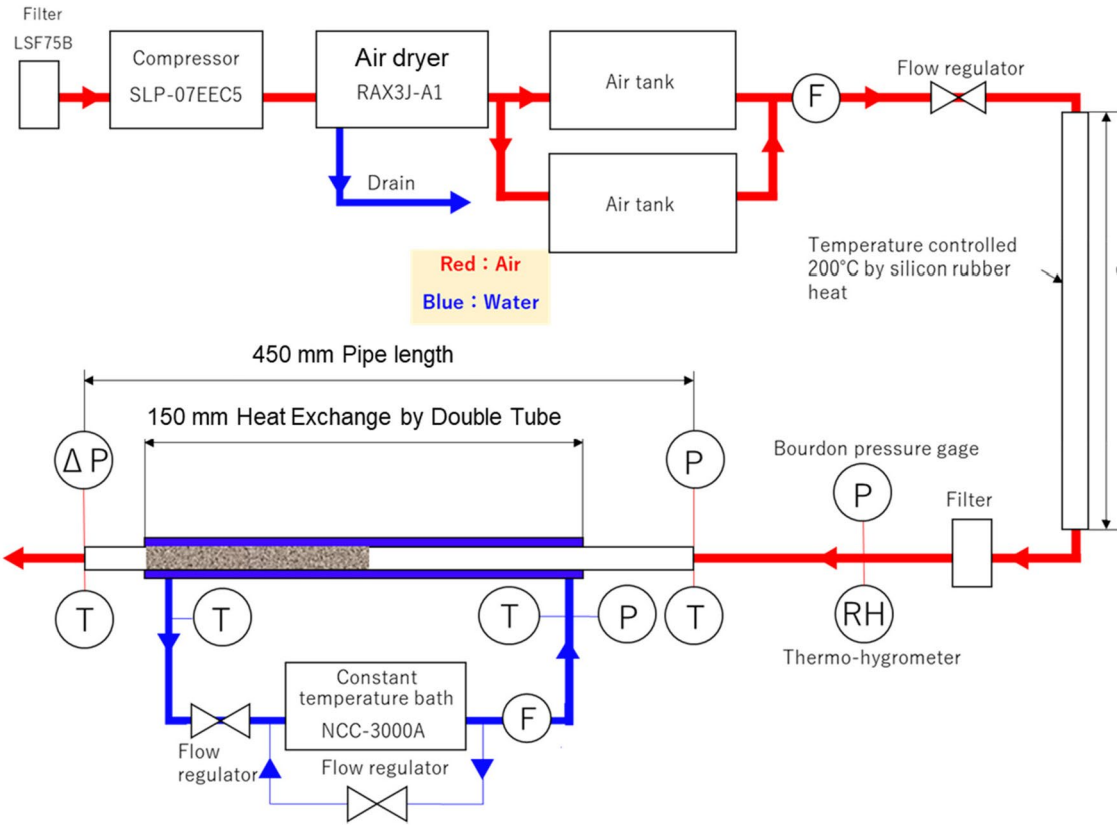
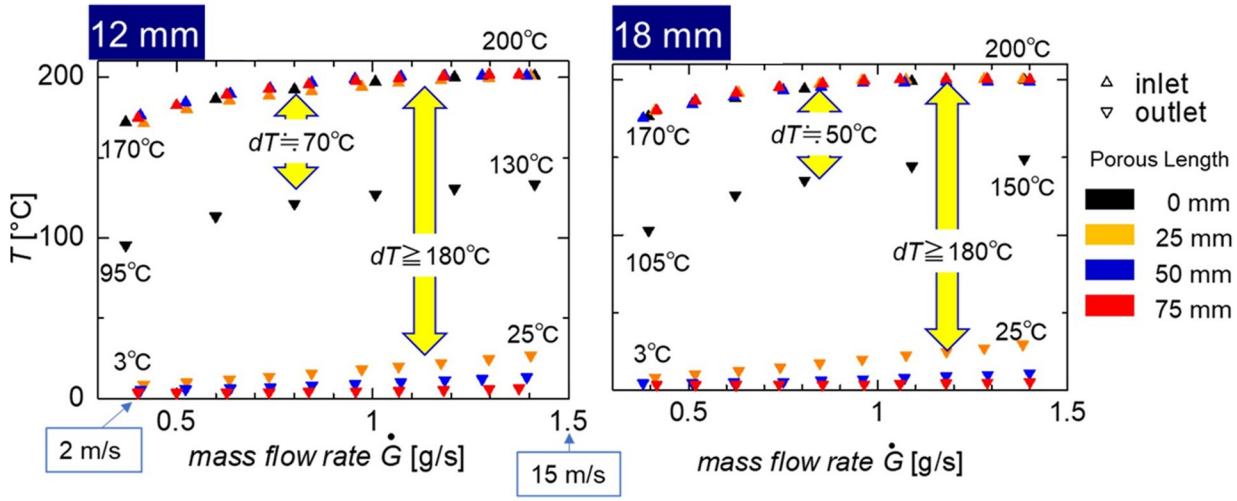


Figure 2 Experimental Setup

Figure 3 shows the heat exchanger ability from the prospective measured inlet and outlet temperatures. The temperature difference of normal tube is almost ΔT = 70 ºC at 12 mm, 50 ºC at 18 mm, however the metal sintered tubes are ΔT = 180 ºC or more even if the porous length only 25 mm.



(a) 12 mm tubes temperature changing (b) 18 mm tubes temperature changing

Figure 3 Heat Exchange Ability of Metal Fiber Sintered Tubes Compered with Normal Tubes