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| Abstract |  |

The unsteady viscous non-Newtonian Micropolar fluid in a 2D channel flow between two permeable walls that are slowly expanding or contracting, driven by applications in industrial and biomedical process. Under the assumption of symmetric injection or suction along the uniformly growing porous walls, we have considered a new model. With the help of similarity transformations and vorticity definition, the governing equations are converted into a system of nonlinear ordinary differential equations. The resultant equations are subsequently solved numerically with MATLAB built-in software ‘bvp4c’. The impact of controlling parameters on flow profiles has been analyzed numerically and illustrated graphically. Furthermore, sensitivity analysis is carried out for friction factor and Nusselt number using response surface modelling in order to find the impact of Ha, K and N on friction factor and Pr, Re and Ha on Nusselt numbers. Thermal profile showing a negative correlation with the Ha but a positive correlation with Re. Ha increases the non-dimensional heat transfer rates for the upper plate. The regression R2 value is close to 1 for every case. Micropolar parameter’s quadratic term (K2) having p-value 0.476 > 0.05 gives less significant impact for Nusselt number and friction factors. The response surface equations are developed for the study of regression model’s strength employing the Analysis of Variance.