

Investigation on Production of Bleachable Chemi-Mechanical Pulp from Wheat Straw

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Introduction

Paper was invented using non wood fibers and during the course of its development thru Asia and then Europe, non woods such as wheat straw were utilized.

For annual plant and wheat straw, mostly soda pulping has been applied.

Wheat straw Alkaline Peroxide Mechanical Pulping was investigated to develop raw material efficient pulping method (Pan and Leary 2002).

In this investigation, our attempts are focused on the development of simple pulping process for wheat straw suitable for small scale production and characterize the pulp properties to be utilized as supplementary pulp for corrugating fine grade paper.

Experimental

Material

Wheat straw in bales was collected from Agriculture and Natural Resources College Experimental Station, Islamic Azad University, Karadj Branch.

Experimental

Pulping

Experimental conditions for Chemi-Mechanical Pulping (CMP) of wheat straw:

Four levels of active alkali (10, 12, 14, and 16%, based on NaOH), one pulping times (40 minutes after reaching the pulping temperature) were studied. Pulping temperature and liquor to straw ratio were constant at 95°C and 8/1 respectively.

Experimental

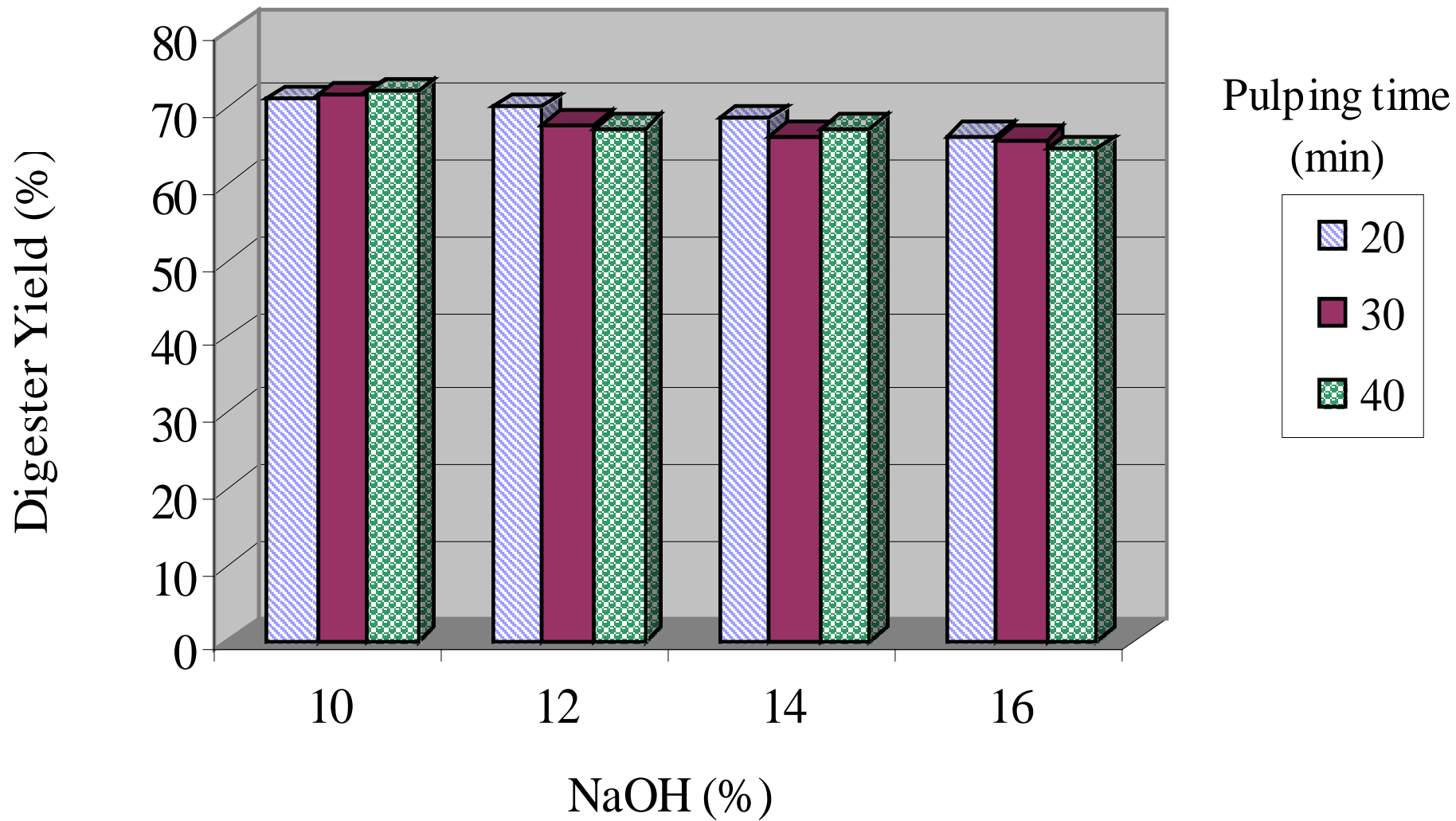
Bleaching

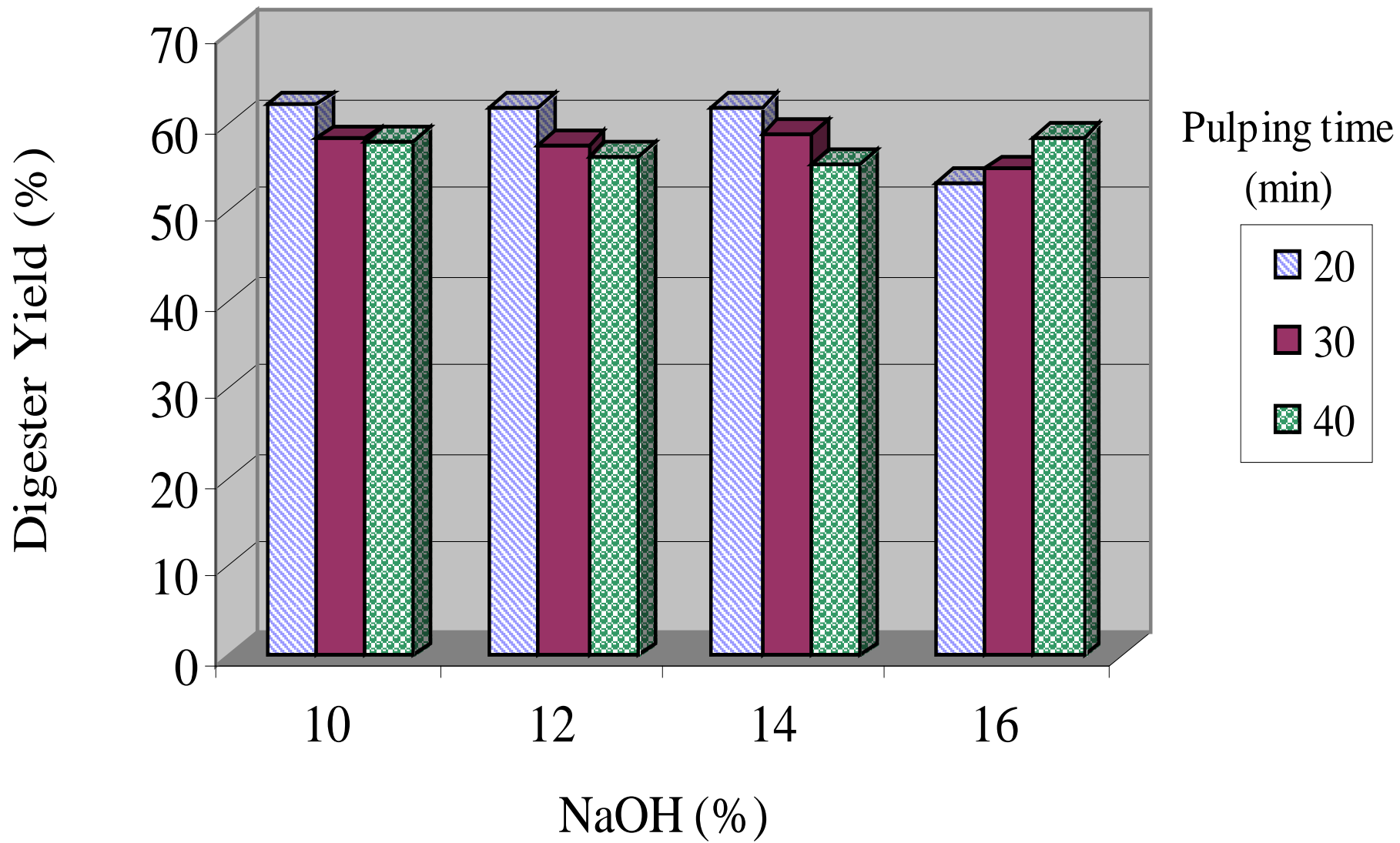
The selected CMP pulp from pulping trails were used for bleaching experiments applying Totally Chlorine Free (TCF) bleaching sequence.

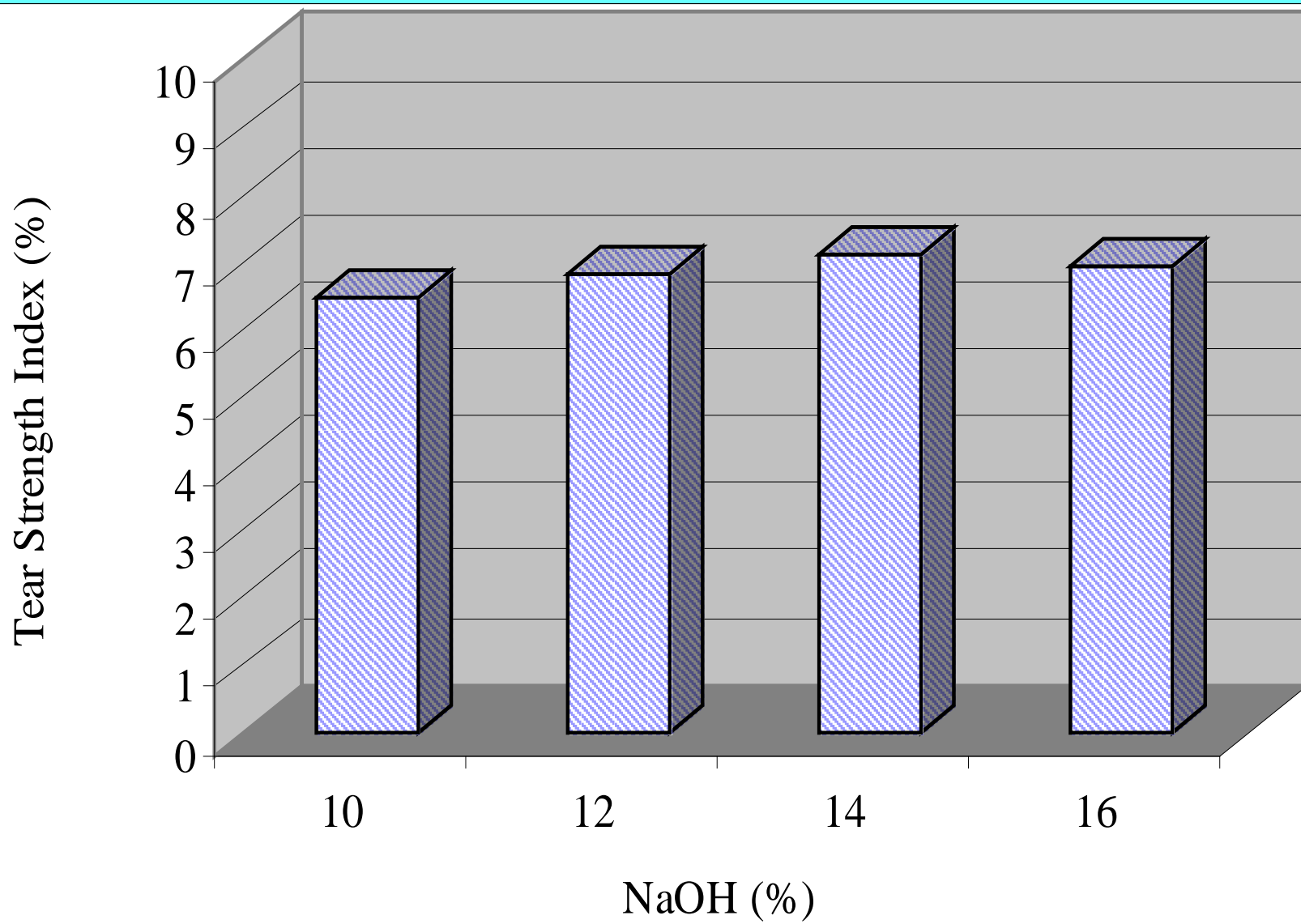
TCF bleaching of chelated pulps was performed using a combination of one of the three levels (2, 3 and 4.5% based on the dry weight of the pulp) NaOH and one of the three levels (3, 3.5 and 4%, based on the dry weight of the pulp) H₂O₂.

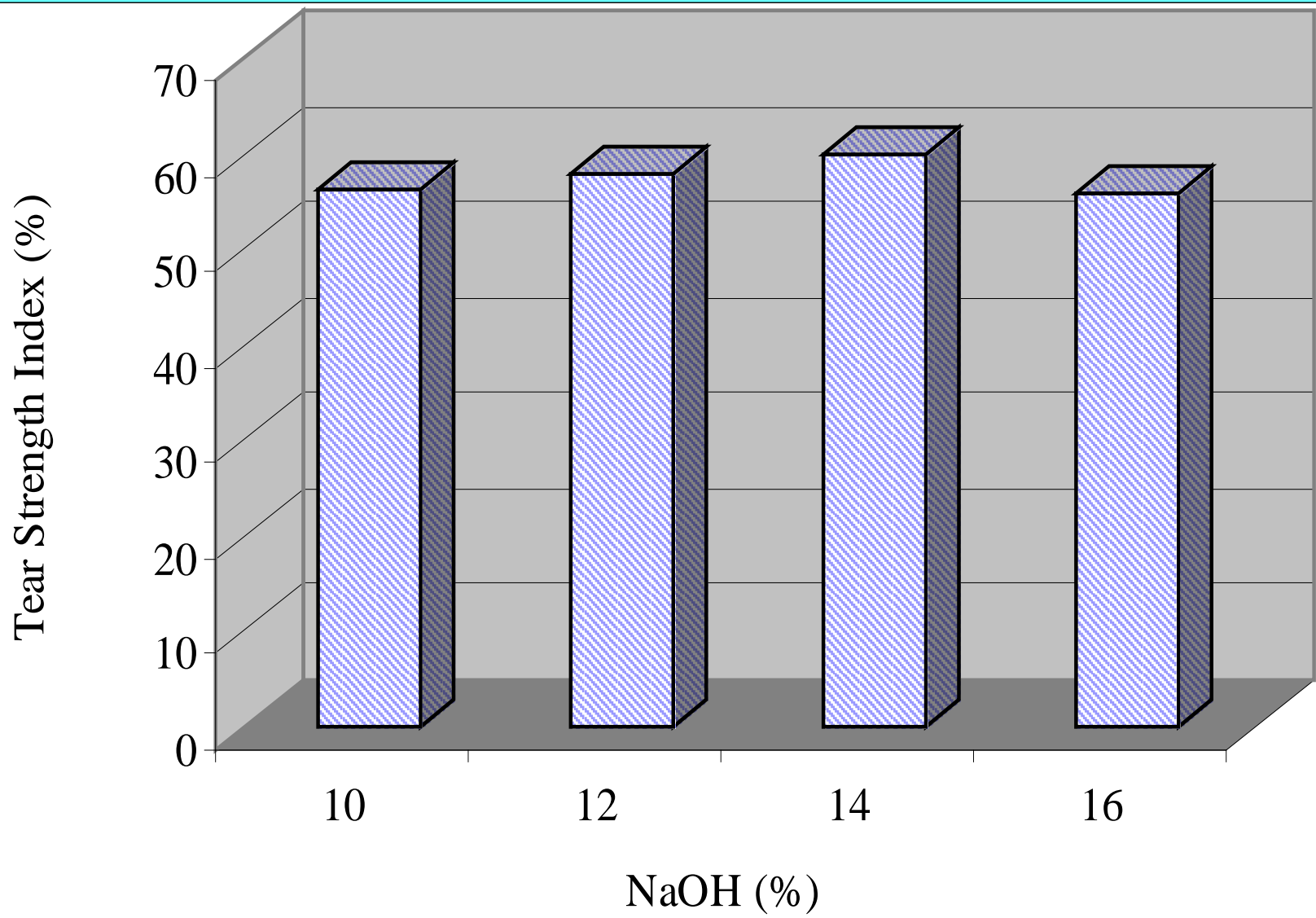
Experimental

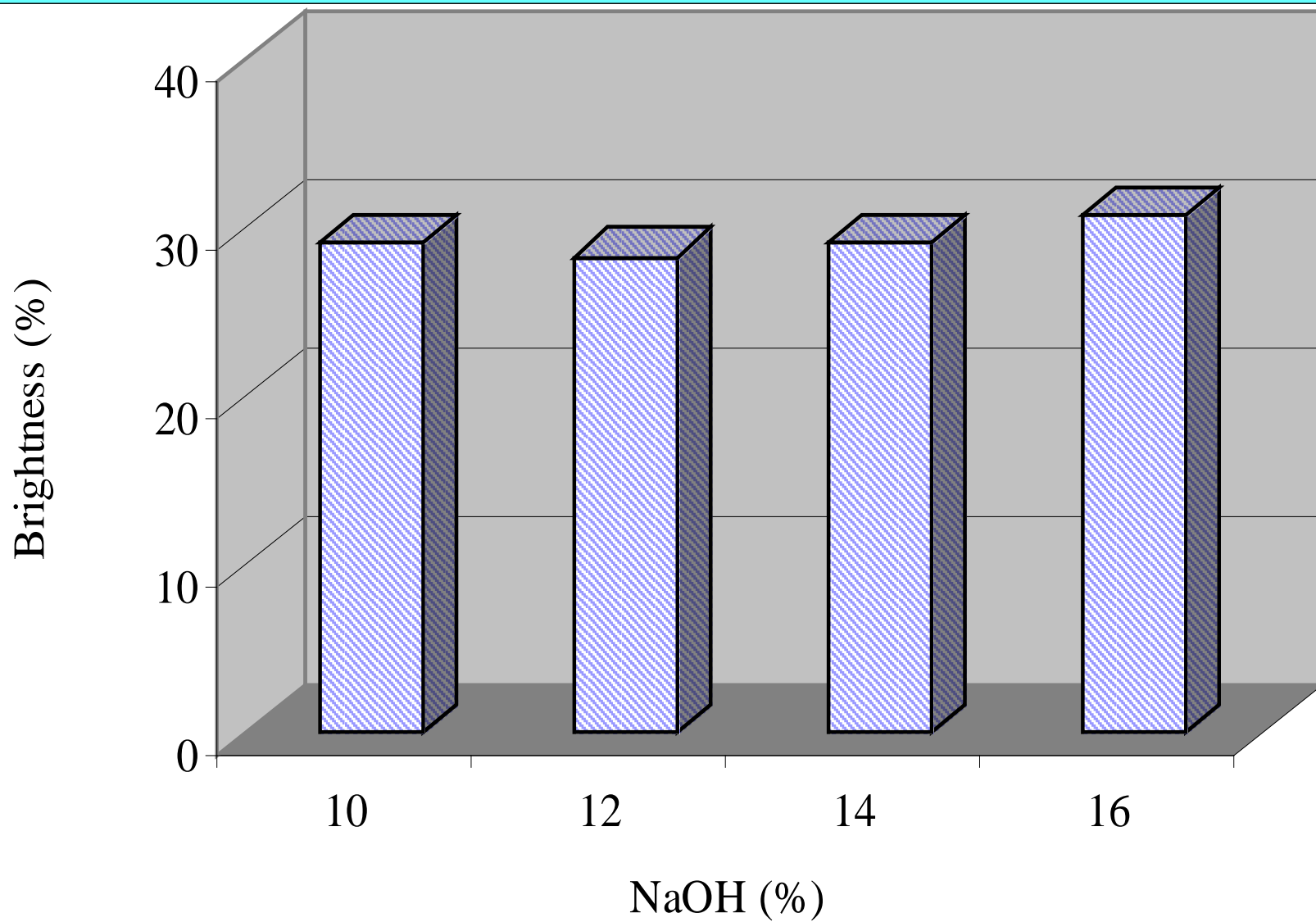
Beating; T248 om-88: Freeness; T227 om-04: Hand sheet preparation; T205 sp-06: Brightness; T452 om-08: Opacity; T425 om-06: Tear strength; T414 om-04: Tensile strength and breaking length; T494 om-92: Burst strength; T403 om-02.



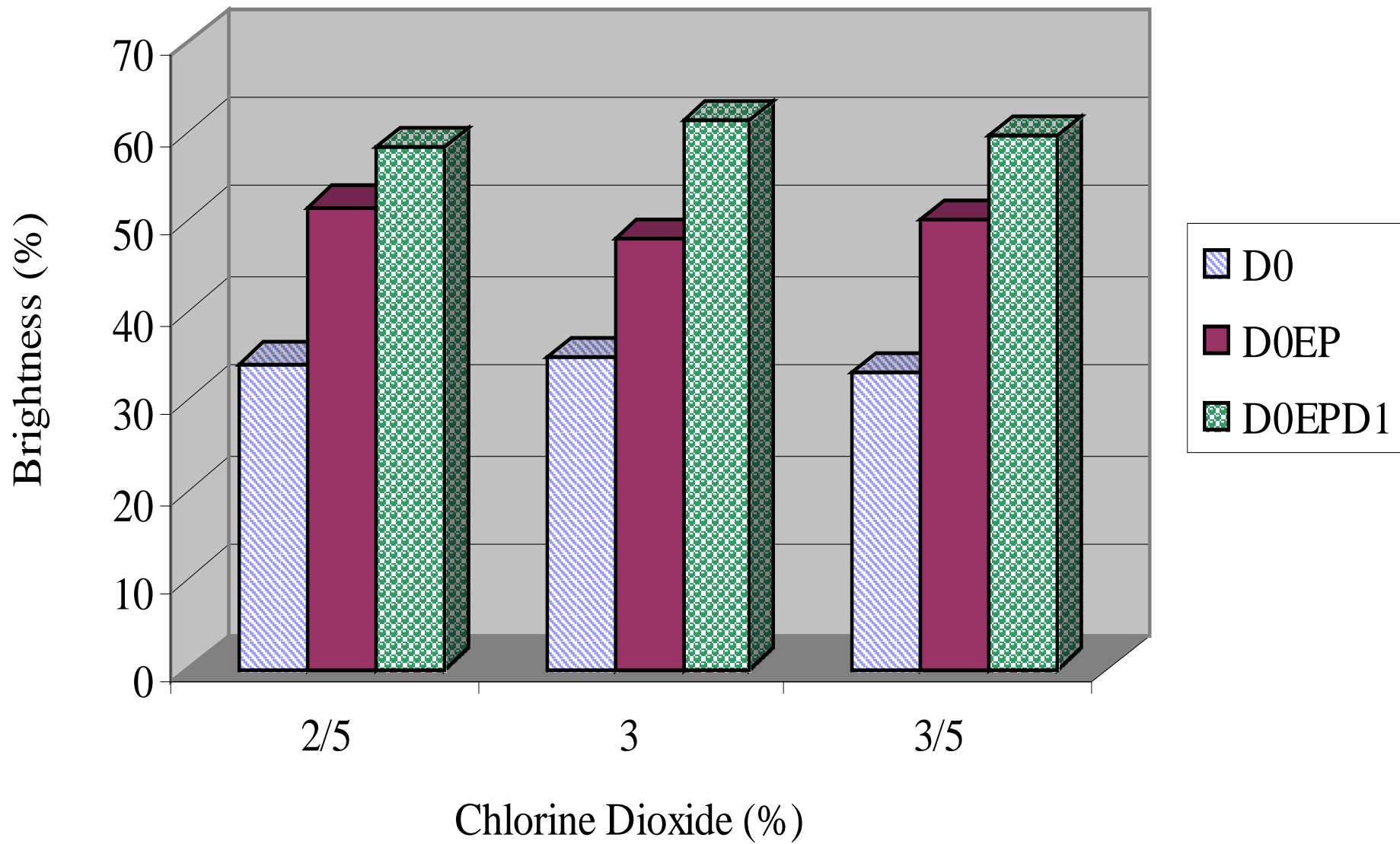


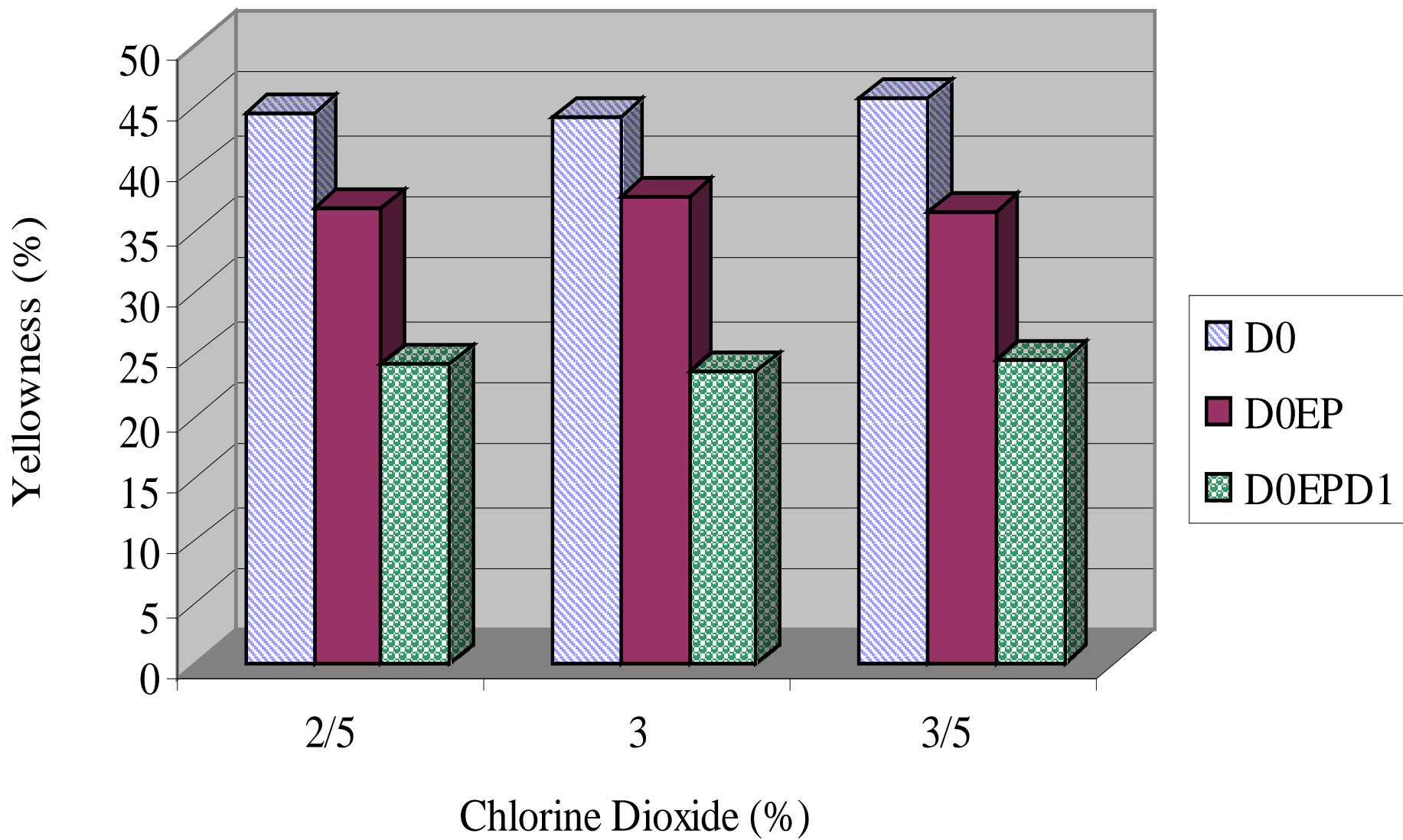


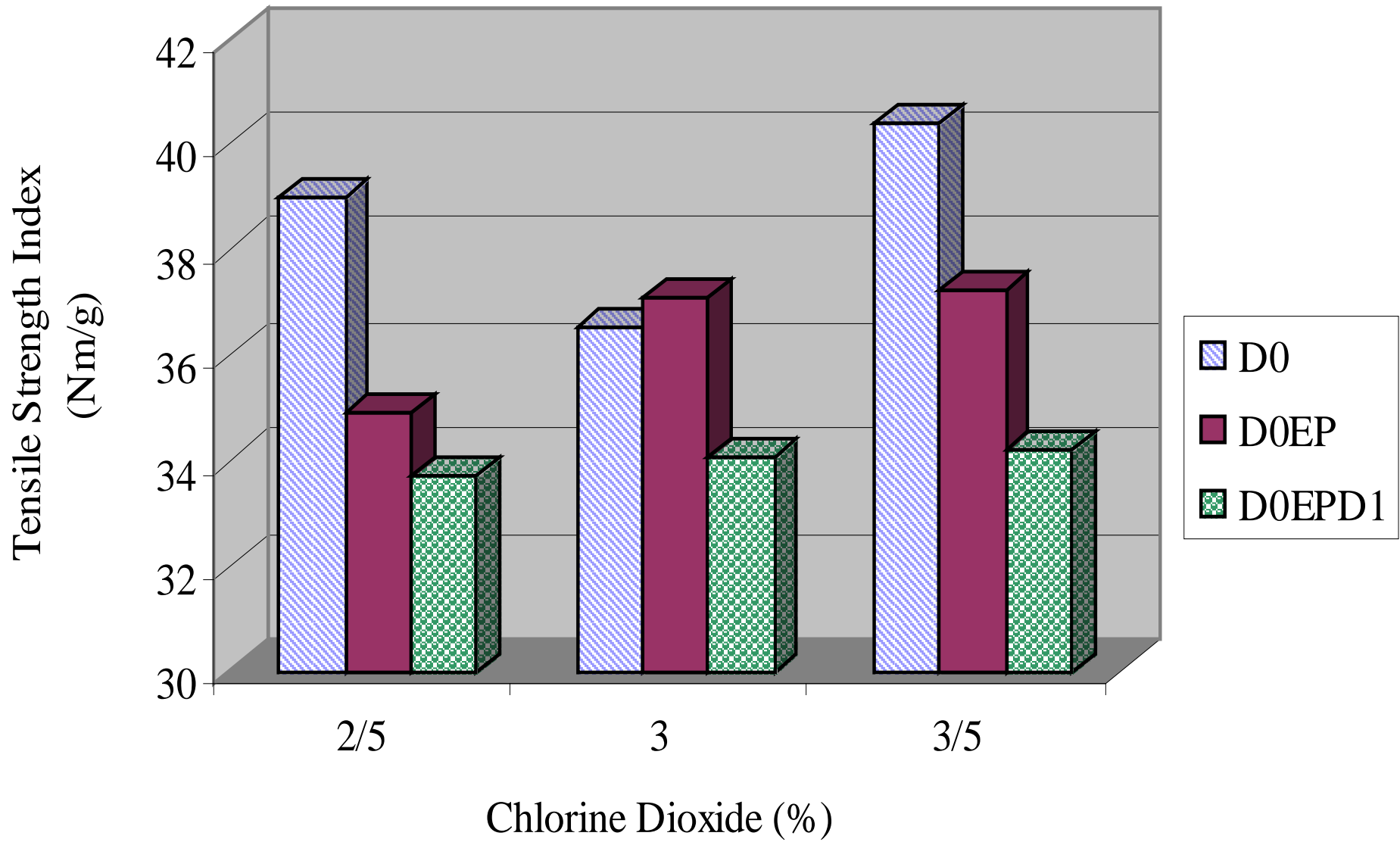


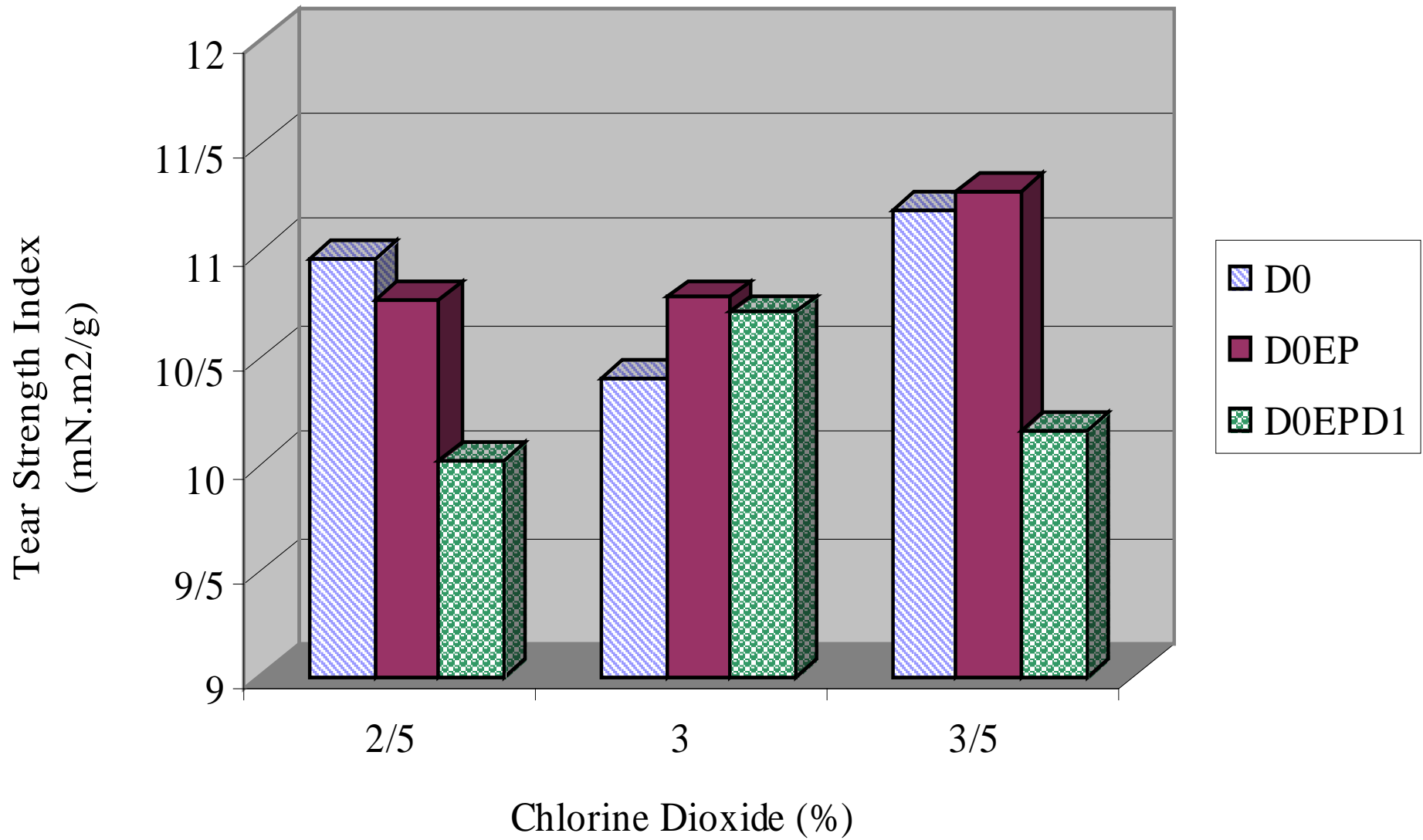


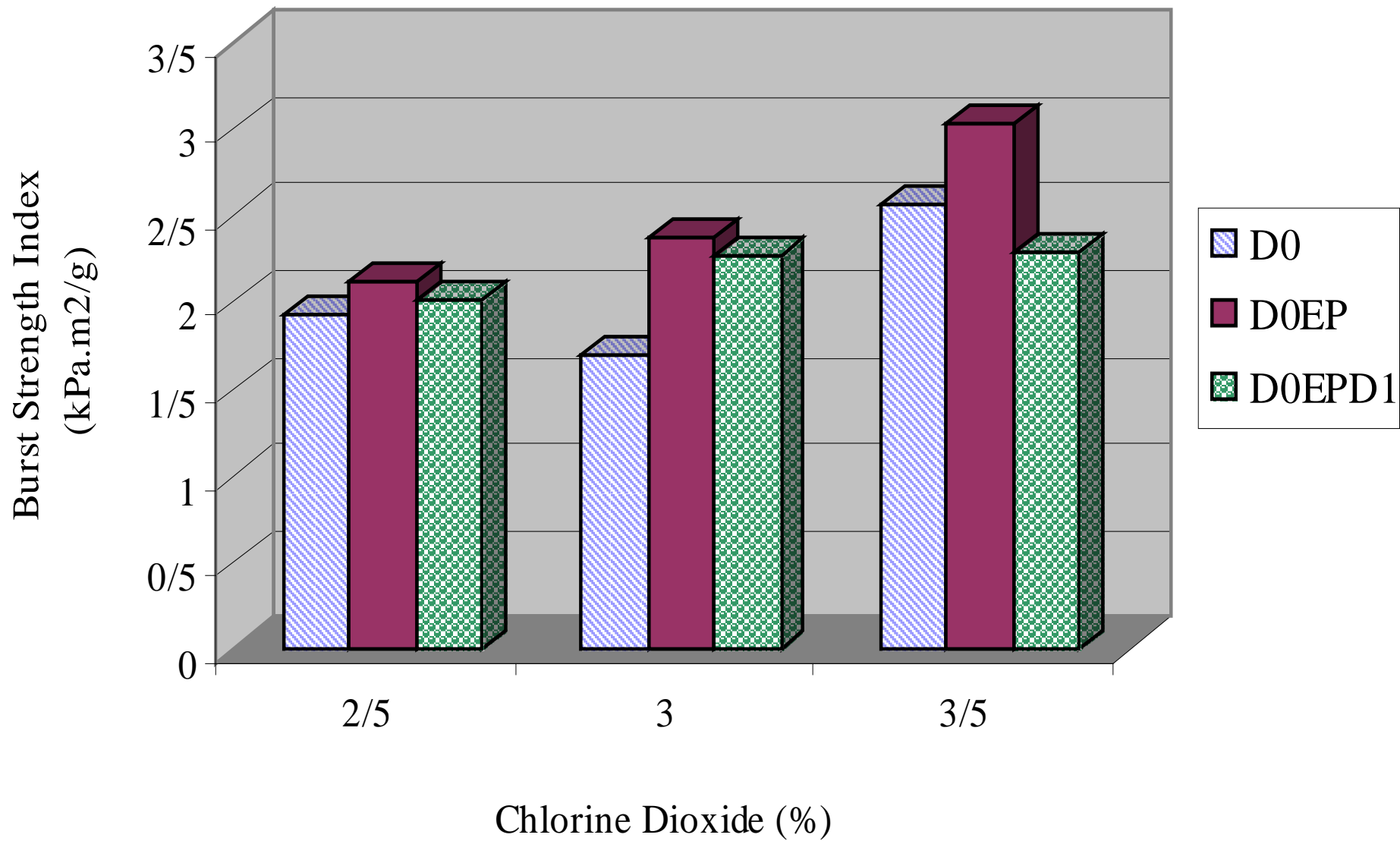
H ₂ O ₂ (%)	NaOH (%)	Brightness (%ISO)	Opacity (%ISO)	Yellowness (%ISO)	Tensile Index (Nm.g)	Tear Index (mN.m ² /g)	Burst Index (kPa.m ² /g)
3	2	45.24	46.37	76.13	43.6	9.5	2.23
3	2.5	43.17	49.43	77.04	40.2	8.93	2.69
3	3	47.79	45.68	75.92	39.1	9.04	2.73
4	2	41.78	50.69	77.48	37.5	9.54	2.84
4	2.5	45.58	47.16	76.47	44.7	10.24	2.64
4	3	47.02	46.24	76	43.3	9.55	2.72
4	3.5	50.69	42.85	76.76	33.3	9.97	2.72
5	3	48.69	42.65	76.66	31.1	9.74	3.01
5	3.5	46.19	46.67	77.27	37.4	10.5	2.57
5	4	46.44	46.22	76.5	41.5	9.97	2.49
5	4.5	46.37	46.36	77.13	30.8	9.47	3.23











Conclusion

CMP pulps from wheat straw applying 10% NaOH, 95°C pulping temperature and 40 minutes time provides a good compromise between the yield and strength. This pulp was TCF bleached using 4% H₂O₂ and 3.5% NaOH to the final brightness of 50.69% ISO.

Conclusion

Tensile index, burst index and tear index of this pulp (72.2% total digester yield) were measured as 33.3 N.m/g, 2.72kPa.m²/g and 9.97mN.m²/g.

Conclusion

Based on the finding of this study, CMP pulping of wheat straw with application of only 10% NaOH as the pulping chemical will open new way for utilization of this unused material, to fulfill the pulp fiber shortage in fiber deficient countries.

A vibrant, high-resolution photograph of a forest path. The path is lined with large, mature trees with thick, textured trunks and dense, bright green foliage that arches over the path, creating a natural canopy. The ground is covered in lush green grass. The lighting is soft and natural, suggesting a bright day. The overall mood is peaceful and serene.

Thank you for your attention